CHAPTER 3

HEAVYWEIGHT TORPEDO MAINTENANCE

OVERVIEW

Identify maintenance requirements at the various levels for both the Mk 48 and the Mk 48 ADCAP and the reporting requirements for each.

OUTLINE

Safety

Organization level maintenance

Intermediate level maintenance

Depot level maintenance

Records and reports

Continuing with our discussion of torpedo maintenance, you will find that the maintenance concept for the Mk 48 and the Mk 48 ADCAP torpedo conforms to the three levels of maintenance previously discussed in chapter 2. They are further defined for specific maintenance in *Mk 48 Maintenance Policy,* NAVSEAINST 8510.11.

SAFETY

Proper use of equipment and material during torpedo maintenance and handling operations is mandatory to assure safety of both personnel and equipment. Hazardous areas of particular significance include Otto Fuel II toxicity, flammability, and its by-products of combustion; electrical equipment; and hazards associated with handling equipment.

OTTO FUEL II HAZARDS

Otto Fuel II is a monopropellant that manifests toxic effects on individuals as a result of vapor inhalation, absorption through the skin, or ingestion of the fuel. For this reason, at least two people must be present during any evolution involving Otto Fuel II operations. Protective items (neoprene or natural rubber boots, polyethylene or neoprene gloves, neoprene aprons, positive pressure air-breathing apparatus [in accordance with NAVSEA Technical Manual, *Otto Fuel II; Safety, Storage, and Handling Instructions,* S6340-AA-MMA-010] or goggles) must be worn as a precautionary measure to control the toxic effects of Otto Fuel II. The positive pressure air-breathing apparatus is not required when it is determined that the work area contains less than 0.2 parts per million (ppm). This is the maximum tolerance level of the fuel. The Otto Fuel II Detector Mk 15 Mod 0 can be used to perform these measurements. This threshold limit value has been established and published in NAVMEDCOMINST 6270.1 as a 0.2 ppm “ceiling” value that is never to be exceeded.

The combustion of Otto Fuel II in the Mk 48 Torpedo (Mod 1, 3, & 4) and Mk 48 ADCAP engines results in exhaust gases containing a number of hazardous components. The most significant combustion products are carbon monoxide (CO), hydrogen cyanide (HCN), and oxides of nitrogen. These gases are poisonous, and special care must be taken to prevent an illness or death as a result of excessive exposure. Carbon monoxide poses a particular hazard during an inadvertent on-deck engine start and “hot-run.” If this occurs, the area must be evacuated immediately. Hydrogen cyanide is both toxic and flammable, and poisoning can result from ingestion of its liquid form (hydrocyanic acid), breathing of contaminated air, or absorption. Absorption occurs most readily through the

eyes, mucous membranes, and feet. In the event of HCN gas poisoning, first aid should be administered immediately, as described in chapter 6 of *Torpedo Mk 48 all Mods, Weapon System Description for the Mk 48 Torpedo,* OP 4020, and chapter 6 of *Torpedo Mk 48 ADCAP Weapon System Description and In-Service Support Equipment for the Mk 48 ADCAP Torpedo,* SW513-EO-MMO-010. Exposure to oxides of nitrogen, even at low levels, presents a particularly deceiving hazard. It will cause an abnormal accumulation of fluid in the lungs. This then results in swelling of tissue and a difficulty in breathing generally occurring 18 to 26 hours after exposure.

Following a torpedo run, the afterbody will be vented and flushed. If the HCN reading exceeds 40 ppm, this operation will be conducted in an open area to eliminate and neutralize the residual gases and acid. The flushing fluid will be stored in a container equipped with a trap or a vent to the outside. Special safety precautions to be followed during the flushing operations are contained in *Torpedo Mk 48 all Mods, Weapon System Description for the Mk 48 Torpedo,* OP 40200; *Torpedo Mk 48 Assembly, Test and Turnaround,* OP 4024, Volume 1 for the Mk 48 Torpedo; and *Torpedo Mk 48 ADCAP On-Line Procedures,* SW513-EO-MMA-010, *Torpedo Mk 48 ADCAP Weapon System Description and In-Service Support,* SW513-EO-PRO-010; and *Torpedo Mk 48 ADCAP Off-Line Procedures,* SW513-EO-PRO-020, for the Mk 48 ADCAP torpedo. Just as hazardous as the Otto Fuel II threat are the various dangers presented by electricity.

ELECTRICAL

To prevent injury or death to personnel from electrical shock and fire hazards when operating and servicing electrical and electronic equipment, you must observe standard safety precautions specified in OPNAVINST 5100.23. Before servicing or adjusting equipment, disconnect power supplies and discharge capacitors. Do not wear metallic jewelry of any kind. In addition, ensure another person qualified to administer artificial resuscitation is present.

HANDLING EQUIPMENT

To prevent injury to personnel and damage to equipment, detailed work sheets have been developed to provide procedures for using handling equipment during torpedo maintenance or transfer. You must observe the weight limits of hoists, chainfalls, cranes, cables, slings, and other lifting equipment. An on going inspection of cables and slings for frayed or broken strands and for crimps before each use is a must. Do not allow personnel to stand directly under a loaded crane or hoist. Maintenance required for handling equipment, including the periodic testing for load carrying capacity, is specified in *Management of Weight Handling Equipment Maintenance and Certification,* NAVFAC P-307 (Ashore), and *Ammunition and Explosives Ashore, Safety Regulations for Handling, Storing, Production, and Shipping,* OP *5,* Vol 1, chapter 8.

TORPEDO MAINTENANCE

The objective of the torpedo maintenance concept is to provide maximum weapon system availability with a minimum requirement for maintenance at the user level.

ITEM CLASSIFICATION

Each item within a torpedo group is classified for logistic and maintenance purposes as a functional item replacement (FIR), repairable spare, a nonrepairable spare, or an expendable item. This classification indicates replacement and repairability considerations for each item within the torpedo. The classifications are defined as follows:

FIR— An item that can be identified as faulty by test or inspection at the intermediate maintenance level. Defective items must be returned to a depot for repair, refurbishment, or other disposition.

Repairable spare— This item can be identified as faulty by test or inspection at the intermediate maintenance level. If repairs are required beyond the scope of intermediate level maintenance, the item must be returned to a depot.

Nonrepairable spare— This item can be identified as faulty by test or inspection at the intermediate maintenance level. Defective items are discarded.

Expendable— This item is replaced routinely without test or inspection as dictated by intermediate level maintenance documentation.

MAINTENANCE INFORMATION

Preparation and maintenance information for warshot and fleet exercise torpedoes is provided in job sheets and flow diagrams in applicable technical manuals for the MK 48 and Mk 48 ADCAP torpedoes. Each job sheet is a removable pamphlet containing step-by-step instructions for performing a specific torpedo job task. The flow diagrams show the sequence of tasks to be performed to accomplish a specific torpedo preparation or maintenance operation. Flow diagrams are provided for the following torpedo operations:

1. Warshot torpedo preparation
2. Fleet exercise torpedo preparation
3. Warshot torpedo verification
4. Fleet exercise torpedo turnaround
5. Backhaul-warshot torpedo turnaround
6. Backhaul-exercise torpedo turnaround
7. Coldshot-exercise torpedo turnaround
8. Warshot-to-exercise torpedo conversion
9. Exercise-to-warshot torpedo conversion

Shore-based ASW shops are capable of all fleet exercise and warshot torpedo preparation and maintenance.

Troubleshooting information is contained in the applicable technical manuals for the Mk 48 and the Mk 48 ADCAP torpedoes.

HEAVYWEIGHT TORPEDO MAINTENANCE CONCEPT

Under this plan, specific maintenance functions have been authorized for each level and are depicted in table 3-1. Torpedo maintenance at the organizational and intermediate levels for both the Mk 48 torpedo and its associated workshop support equipment (WSE) is currently being provided by two facilities: the Naval Undersea Warfare Engineering Station (NUWES), Keyport; and Westinghouse Electric Corporation (WECO), Logistics and Support Department, the prime contractor. Depot level support for the unique portions of the Mk 48 ADCAP torpedo and torpedo hardware common to the Mk 48 torpedo is provided by NUWES, Keyport.

Table 3-1.-Heavyweight Torpedo Maintenance Concept

WEAPON SYSTEM ELEMENT	o ORGANIZATIONAL x RFI Activity	o INTERMEDIATE	o DEPOT x MRF
Heavyweight Torpedo	o x Inspection	o System Checkout	o x FIR Unit Repair
	o x Storage	o Subsystem Checkout	o x ORDALT Accomplishment
	o x Handling	o Fault Isolate to FIR/Component Level	o Shell Repair
	o Tube Loading	o FIR/Component Replacement	
	o Prelaunch Check	o Disassembly/ Assembly	
	o Command Control Wire Splicing	o Cosmetic Repair	
	x Cosmetic Repair	o Fueling	
	o x External Cleaning/ Preservation	o TMD Installation/ Removal	
	o x TMD Installation/ Removal	o ORDALT Accomplishmemt	
	o x A-cable Installation/ Removal	o Pingers	
	o x Preventive	o RFI Storage/ Maintenance Issue	

Table 3-1.-Heavyweight Torpedo Maintenance Concept—Continued

WEAPON SYSTEM ELEMENT	o ORGANIZATIONAL x RFI Activity	o INTERMEDIATE	o DEPOT x MRF
Warhead Mk 107 Mods 0/1/2	None	o Subsystem Checkout	o x FIR Unit Repair
		o Fault Isolate to FIR/Component Level Replacement	o x ORDALT Accomplishment
		o EAW/WES Installation	
		o Disassembly/ Assembly	
		o Exploder/Arming Device Installation	
		o Vacuum/Freon Leak Testing	
Exercise Head Mk 88 Mods 2/3/4, Exercise Head Mk 92 Mod 0 or FES Mk 94/0	None	o Subsystem Checkout	o Page Assembly Repair
		o Data Reduction	o Harness/Cable Repair
		o Fault Isolate to Page Assembly	o x ORDALT Accomplishment
		o Page Assembly Replacement	
		o Disassembly/ Assembly	
		o ORDALT Accomplishment	
WSE and ISSE	None	o Fault Isolate to Circuit Card/ Component Level	o x Component Card Replacement
		o Preventive Maintenance	o Circuit Card
		o Circuit Card/ Component Replacement	o ORDALT Accomplishment
		o ORDALT Accomplishment	

Table 3-1.-Heavyweight Torpedo Maintenance Concept—Continued

WEAPON SYSTEM ELEMENT	o ORGANIZATIONAL x RFI Activity	o INTERMEDIATE	o DEPOT x MRF
Reusable Containers	None	o Replace Minor Mechanical Components o Replace Expendables o Storage	o Replace Major Components o Structural Repairs

Abbreviations:

EAW —Electronic Assembly Warhead
FIR —Functional Item Replacement
ORDALT—Ordnance Alteration
MRF —Minor Repair Facility
WSE —Workshop Support Equipment
RFI —Ready-For-Issue
TMD—Torpedo Mounted Dispenser
FES —Fleet Exercise Section
ISSE —In-Service Support Equipment
WES —Warhead Electronic System

Before continuing on, let's take a moment to review Otto Fuel II, electrical and handling equipment safety.

Torpedo maintenance is accomplished by Navy personnel at the organizational and intermediate levels. The contractor provides depot level maintenance for both the torpedo and automated test equipment. The Naval Undersea Warfare Engineering Station (NUWES), Keyport, Washington, provides depot level maintenance on all other equipment.

Torpedo system maintenance is classified as either remedial, turnaround, or preventive.

Remedial maintenance is done on a nonscheduled basis and consists of restoring the torpedo, automatic test equipment, and other support equipment to a satisfactory condition after malfunctioning, experiencing damage, or deterioration. This maintenance involves expendable, spare, and FIR item replacement. With the exception of torpedo inspections and corrosion prevention measures, there is no remedial maintenance at the organizational and ready for issue (RFI) support levels.

Turnaround maintenance refers to exercise turnaround and warshot verification. Turnaround maintenance is performed at intermediate level activities. The maintenance includes refurbishing the torpedo to an operational condition after exercise runs and installation of replacement parts for expended or deteriorated items. Warshot torpedoes are periodically verified for operational readiness.

Preventive maintenance is performed on a routine basis and is intended to minimize equipment failures through recognition and correction of potential problems before they occur. This maintenance consists primarily of routine cleaning, inspection, and readiness verification testing. Preventive maintenance of workshop equipment also includes lubrication, calibration, and minor adjustments.

ORGANIZATIONAL LEVEL MAINTENANCE

Submarines and Ready-for-Issue (RFI) support activities comprise the organizational maintenance level. It is intended that only limited corrective maintenance be accomplished at the organizational level. Accordingly, onboard torpedo maintenance is limited to visual inspection; exterior cleaning; A-cable installation and removal; guide stud, guide and bearing plate installation and removal; and command wire splicing. Organizational level personnel also perform weapon stowage, handling, tube loading, and pre-launch checks.

Torpedoes retrieved during exercise operations are required to be washed down with fresh water to prevent corrosion damage. The torpedo should be returned to a flushing facility for postrun preservative flushing within 3 days after recovery.

If the torpedo cannot be given a preservative flushing, it must be returned to an intermediate level maintenance activity (IMA) in sufficient time to allow for engine teardown within 9 days after recovery. If a torpedo receives a preservative flushing after retrieval, the maximum interval between torpedo firing and turnaround is 21 days.

Submarine Maintenance

Some of the specific maintenance that you might expect to perform while onboard a submarine would be: receipt\transfer inspection, A-cable removal-replacement-and installation, torpedo mounted dispenser (TMD) installation, communication wire troubleshooting, and splicing on both the torpedo and TMD sides.

Torpedoes that have been exposed to seawater or stored in a flooded or dry tube will be cleaned and inspected at weekly intervals; whereas torpedoes stowed in rails/cradles receive only monthly cleaning and inspection. Any torpedo that does not satisfy prelaunch checkout requirements will be removed from the tube and returned to rack stowage for subsequent transfer to an IMA.

Heavyweight torpedoes and TMDs are susceptible to corrosion damage, which may not be detectable by submarine personnel. This is likely to develop a requirement for expensive IMA/depot repair. Submarine personnel **must** report torpedoes that have been in a flooded-tube environment upon returning to port. This is accomplished with a corrective maintenance/ deficiency report being submitted. Additionally they will record appropriate torpedo history sheet entries in accordance with instructions contained in section 8 of NAVSEA OD 45814.

Detailed descriptions of maintenance procedures authorized for submarine personnel are contained in the appropriate volume of OD 44979 and in maintenance requirement cards (MRCs).

Ready-For-Issue Support Activities

Submarine tenders (AS) and specified shore facilities perform Mk 48 and Mk 48 ADCAP torpedo handling, stowage, emergency defueling, and minor cosmetic repair. These activities are organizational level in nature, but have been designated as RFI support activities. They perform authorized torpedo support for the Mk 48 torpedo in accordance with *Torpedo Mk 48 Assembly, Test and Turnaround*, Volume 3, OP 4024. Mk 48 ADCAP torpedo evolutions will be performed in accordance with *Torpedo Mk 48 ADCAP Piece Part Inspection Procedures*, SW513-EO-PRO-030.

Some examples of the specific maintenance you might be expected to perform onboard an RFI facility would be: preparing a weapon for issue or stowage, torpedo inspections (warshot and exercise), afterbody\tailcone inspection, TMD inspection, removal, installation, packing and unpacking, guide stud assembly\ bearing plate\ guide inspection, turnaround, and installation, TMD and torpedo wire splicing, wire splice and flex-hose connection, A-Cable turnaround, installation and removal.

If corrective maintenance were to be performed, you would be responsible for the removal, inspection, and installation of the guide stud assembly, bearing plate or guide, repair to damages or defects to the transducer or torpedo shell, and the replacement of defective TMDs.

INTERMEDIATE LEVEL MAINTENANCE

Production and maintenance at IMAs include warshot and exercise preparation, warshot verification, exercise teardown/turnaround, exercise to warshot and warshot to exercise conversions, weapon stowage, fault isolation, and corrective maintenance performed down to the FIR/replaceable component level. The extent of weapon disassembly and depth of testing depend on the condition of the torpedo upon receipt at the IMA; for example, an exercise fired unit will normally require a greater degree of maintenance than an unused exercise or warshot unit returned from stowage onboard a submarine.

Each IMA is equipped with individual maintenance lines of workshop support equipment (WSE), along with requisite utility services necessary to accomplish both on-line testing and off-line service and maintenance tasks. They are capable of performing all Mk 48 torpedo maintenance as defined in OP 4024, Volumes 1 and 2. Mk 48 ADCAP torpedo maintenance is defined in SW513-EO-PRO-010 and SW513-EO-PRO-020.

Procedures for servicing the torpedo are described in detail on job sheets and flow diagrams. So, let's take a moment to review how to use the job sheets and flow diagrams.

Job Sheets

Job sheets give you step-by-step directions for performing particular tasks. Flow diagrams program the tasks described by the job sheets into sequences designed to change incoming components or torpedoes into ready-to-fire torpedoes of a preplanned configuration (warshot or exercise).

Figure 3-1 shows the first page of a typical job sheet. The first page of the job sheet contains a

JOB SHEET P–35
SPEED CONTROL VALVE REMOVAL AND INSTALLATION

WARNING

If exercise turnaround or warshot verification is being performed, OTTO Fuel II will be encountered. This job sheet must then be performed in a well ventilated area. Personnel must wear all safety clothing listed under common requisites, and observe all applicable safety precautions. When OTTO Fuel II is not encountered, protective clothing is not required.

MATERIALS

COMPONENTS

Packing, preformed, Dwg. 2502774-4
Packing, preformed, Dwg. 2502774-5
Packing, preformed, Dwg. 2502774-30
Pump, fuel, Dwg. 2064208 (with speed control valve installed) or
Pump, fuel, Dwg. 2064208 (less speed control valve)
Screw, socket head, MS16998-33 (4)
Valve assembly, speed control, Dwg. 2507319
Washer, Dwg. 2498489-1 (4)

SPECIAL REQUISITES

Pad, workbench, Dwg. C70528

COMMON REQUISITES

Adapter, 3/8 M x 1/4 F
Apron, neoprene (or equivalent)
Boots, neoprene (or equivalent)
Coveralls, disposable
Gloves, neoprene (or equivalent)
Goggles, chemical (or equivalent)
Grease, MIL-G-4343
Kit, preformed packing, extraction/ installation
Ratchet, 3/8 sq dr
Swabs, cotton tipped
Wrench, hex head, 5/32 x 3/8 sq dr
Wrench, torque, 75-0-75 lb-in 1/4 sq dr

P-35-1 SPEED CONTROL VALVE ASSEMBLY REMOVAL

1. Using 5/32-in hex head wrench and ratchet, remove four socket head screws and washers securing speed control valve to fuel pump, Figure P-35A.

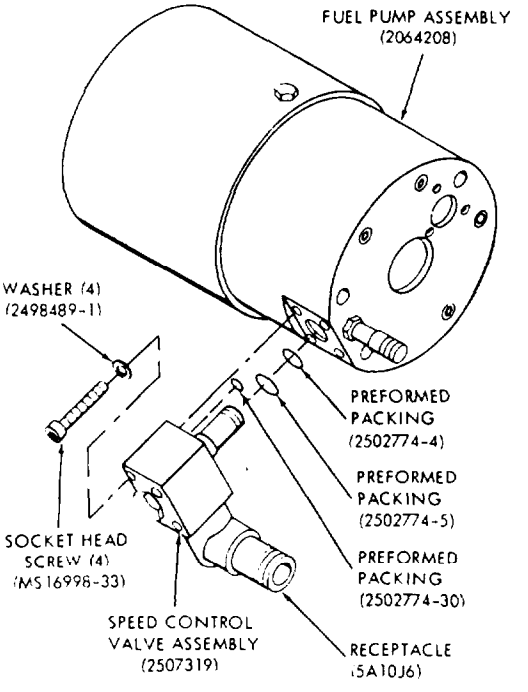


Figure P-35A Speed Control Valve Removal/Installation

Figure 3-1.-First page of a typical job sheet.

list of materials required to do the job. Materials on the list are separated into components, special requisites, and common requisites. Components are parts of the torpedo to which the job sheet relates. Special requisites are the tools or equipment unique to the Mk 48 or the Mk 48 ADCAP and are designed or modified especially for these units. Common requisites are commercial tools or equipment normally stocked in an intermediate level workshop.

The first illustration in a job sheet is an overall view to orient the user to the task the job sheet describes. Additional illustrations are used as required to clarify complex stages of the task. Important details and parts to be removed or replaced are shown in exploded views. All components shown are identified by part number. In this manner, the drawing assists the maintenance personnel in identifying parts to be replaced.

The text of a job sheet instructs the user in the completion of the task by describing the use of designated tools and referring to the illustrations. Each step to be taken is fully described and numbered for easy reference. A job sheet may include more than one job, if jobs are functionally related. For example, whenever removal and installation of a component involve the same materials and can use the same illustration, they are combined into one job sheet.

At the discretion of the commanding officer or weapons officer, subheads within job sheets may be performed in any technically correct order, provided that the sequence of accomplishment is documented as being authorized by the commanding officer or weapons officer before the start of the job sheet.

Some job sheets may direct the worker to replace\reject an item if it fails during the testing process. IMAs are encouraged to determine if the failure can be corrected by turnaround of the unit a second time vice returning it to the depot for repair.

Where required, job sheets contain quality assurance sheets for use by the quality assurance organization. This ensures that only safe reliable weapons are issued.

You should use and follow job sheets at all times regardless of how proficient you may become.

Quality Assurance

The complexity of the Mk 48 and the Mk 48 ADCAP torpedoes dictates the need for a viable quality assurance program at the preparing activity level to ensure that only reliable weapons are issued to the fleet. To provide quality effort at all IMAs and have it uniform throughout, quality requirements are included in technical manuals used by the IMA during maintenance of the torpedo. They are basic requirements necessary to produce a weapon that will provide the highest probability of mission accomplishment. A NAVSEASYSCOM publication, *Heavyweight Torpedo Intermediate Maintenance Activity Quality Assurance Manual,* has been prepared as a uniform single-source document for all Mk 48 and Mk 48 ADCAP torpedo IMAs. This manual contains the policies and requirements that must be enforced at all levels of production to ensure that the torpedo will successfully complete its mission.

Quality assurance (QA) procedures and verification points used during maintenance of the torpedo are based on the minimum quality effort necessary to verify that significant operations have been properly accomplished. This effort provides a high degree of confidence in weapon reliability with the least amount of interference in normal shop operations.

When you are assigned as one of the maintenance personnel, you must do each operation in the order displayed on the flow charts and as instructed by the job sheets, and you must honor all hold and verification points. The QA inspector must verify all significant operations at QA hold points.

Job sheets, which require quality assurance, contain hold points indicated by a **STOP** symbol. The **STOP** symbol is located before the steps requiring sign-off, or at a point where the inspector must verify a number of completed operations before processing can continue. You must stop performing the maintenance where the symbol appears. You may assume maintenance procedures after an inspector has signed the appropriate column on the QA sheet. When consecutive QA steps are listed on a QA sheet, only a single stop point preceding the initial QA inspection point is required. When the job sheet states “Initial QA Sheet,” you would stop work and sign the initial column of the step just completed before proceeding with the work. If the job sheet contains a test where no printed record is made, an inspector may be called on to witness the test.

There are no specific QA hold points on individual job sheets that call for a general inspection of components before assembly. The

inspection is performed by you during disassembly and cleaning operations. Quality assurance personnel will, however, verify the condition of the hardware at QA hold points or periodically through roving inspections. Suspect areas found by the inspector should be brought to the attention of shop personnel.

The assembly serialization and quality assurance sheet is used to indicate the job sheet section and step number where quality hold points or verifications are to occur, and provides space to record assembly serial numbers where required. The sheet also provides for the initialing by the individual doing the work and the quality assurance inspector. After completion, the sheet is signed by the assembly supervisor and the quality assurance supervisor. Figure 3-2 is an assembly serialization and quality assurance sheet used during turnaround of the water intake valve.

Flow Diagrams

A flow diagram is a pictorial representation of the order in which events occur during torpedo maintenance. Flow diagrams show all paths that you must follow in assembling and testing the torpedo. The paths represent the work flow from one task to the next. Each path lists the job sheets for the task that must be accomplished to complete that path. Figure 3-3 illustrates an example of a typical flow diagram.

A flow diagram generally indicate the normal, uneventful course of operations. A flow diagram may require deviation to troubleshooting procedures in the event of a no-go condition or other unforeseeable abnormal situation. Troubleshooting and no-go correction procedures are contained in the applicable manuals for both the Mk 48 and Mk 48 ADCAP. Obviously, every possible circumstance cannot be accommodated in the flow diagram. Therefore, it behooves the shop supervisor and quality assurance organization to be alert to unusual situations and to use their experience and judgment to bring the torpedo\group\component to a condition that will reestablish the normal flow pattern as expeditiously as possible. Special symbols used in the flow diagram are as follows:

1. A parallelogram ▱ indicates material entering the process for the first time or leaving the process for the last time. Input items are materials necessary for assembly or testing. Output items may be for issue, stowage, or shipment to a depot. Arrows indicate whether the item is input or output.

REGISTER NUMBER		
SECTION	SERIALIZATION AND/OR QUALITY ASSURANCE STEP	INITIALS OR SERIAL NO.
P-5-1	Step 32 - Locknut torqued to 16 ± 2 in-lb	
	Step 37 - Plug torqued to 240 ± 10 in-lb	

ASSEMBLY SUPERVISOR: _____ (NAME) _____ (DATE) _____ (ACTIVITY)

QA SUPERVISOR: _____ (NAME) _____ (DATE) _____ (ACTIVITY)

Figure 3-2.-Assembly serialization and QA sheet.

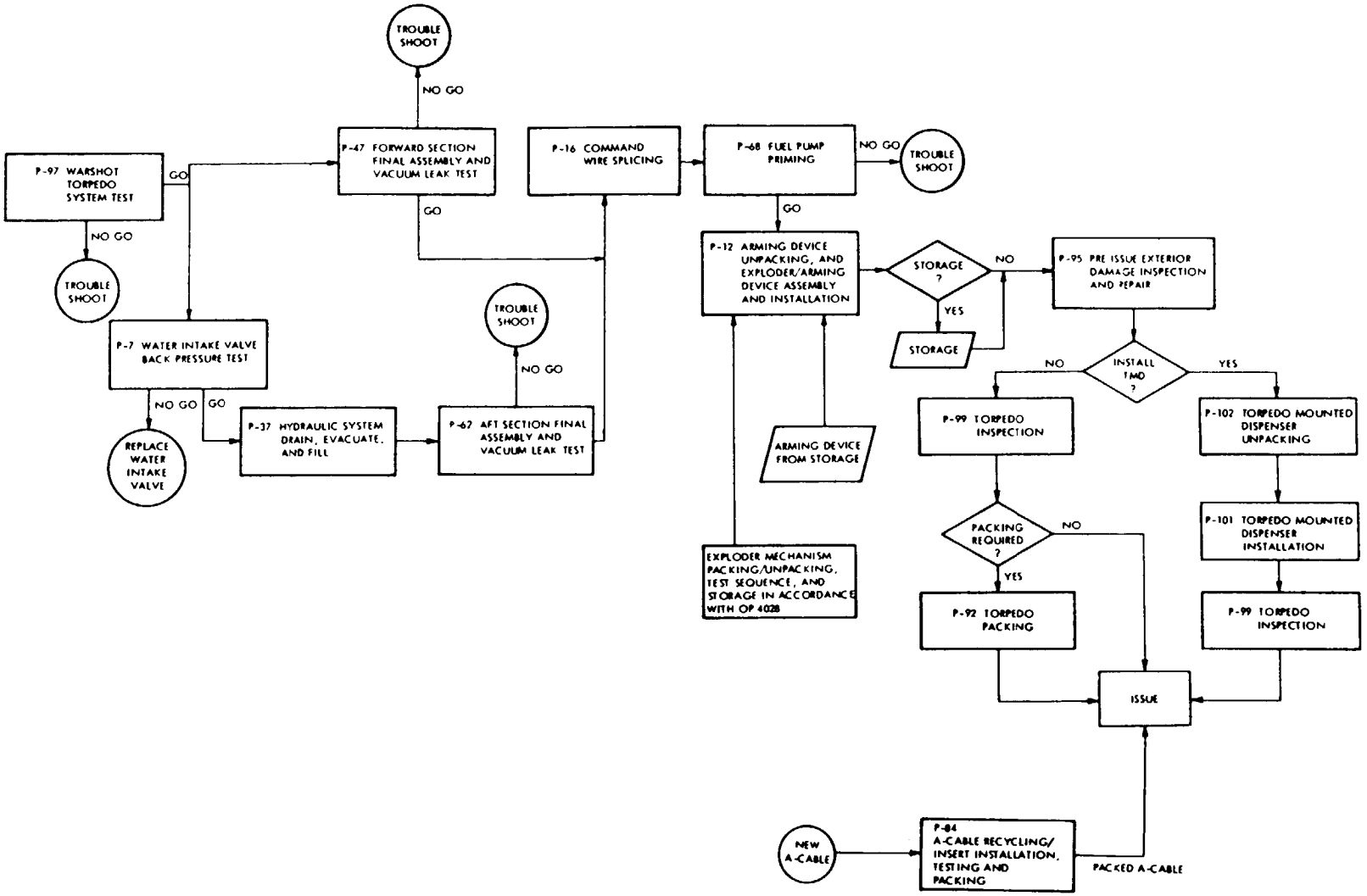


Figure 3-3.—Typical flow diagram.

2. A diamond ◊ indicates a decision point. It asks a question that can be answered yes or no. The answer chosen indicates the branch of the flow diagram to be followed.

3. A rectangle ▭ usually indicates an operation to be performed as indicated by the job sheet or part of a job sheet listed within the rectangle. Occasionally, several related operations are listed in one rectangle. Operations so listed can be done in any sequence, or unless limited by capacity of equipment, can be done simultaneously. On rare occasions, rectangles direct the reader to execute procedures that are contained in another OP.

4. A circle ○ indicates a break in the flow. The note within the circle identifies the point at which the flow is picked up, whether elsewhere on the same diagram or at some point on another diagram.

5. An arrow → indicates direction of flow. Branching paths indicate simultaneous or mutually independent operations, all of which must be performed.

Let's take a moment here to further your understanding of the maintenance that you may one day be performing at an IMA facility. To fully understand the different sections that we are discussing, let us look at the torpedo group configuration for the Mk 48 (fig. 3-4), and the

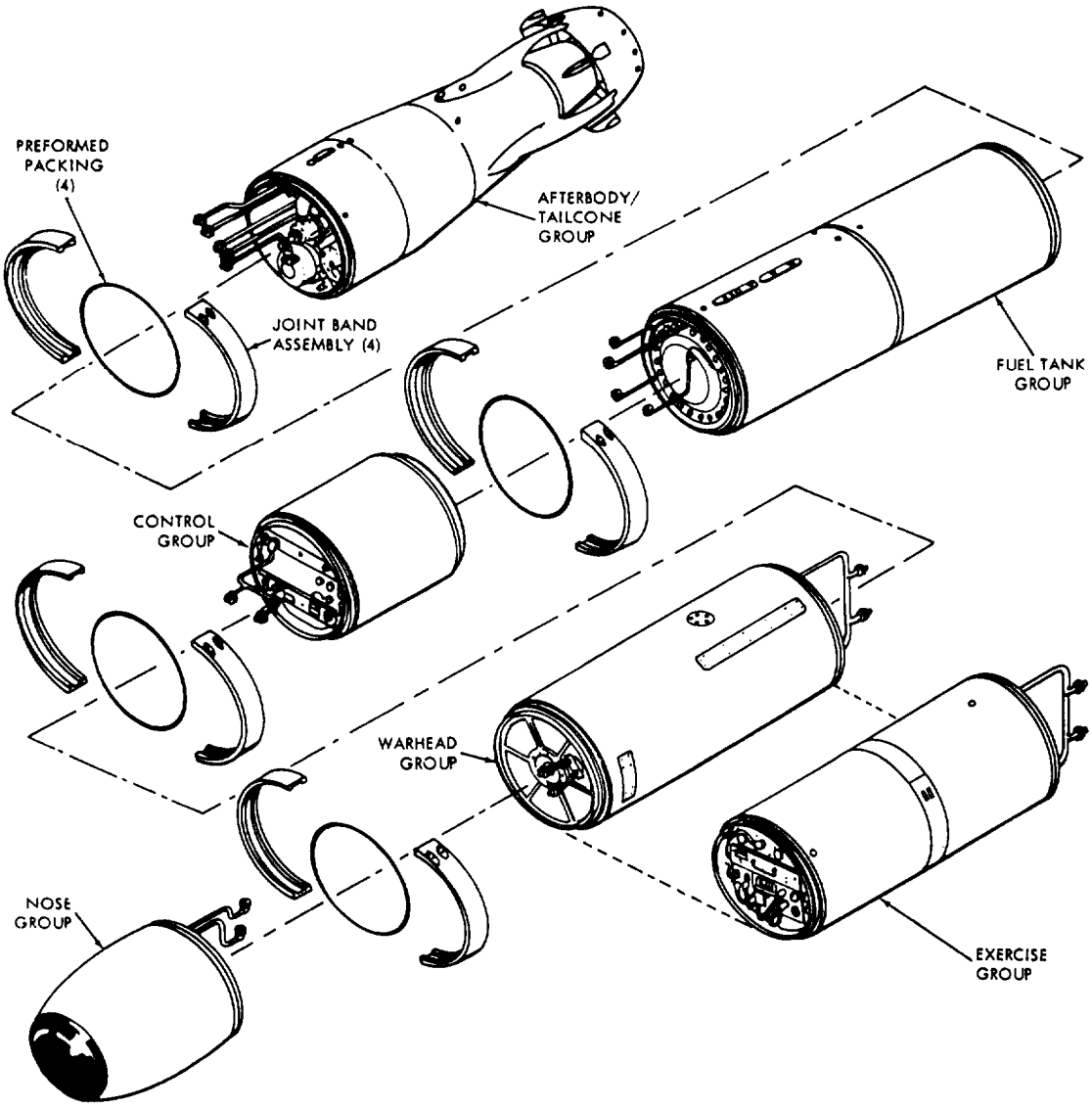


Figure 3-4.-Mk 48 torpedo group configuration.

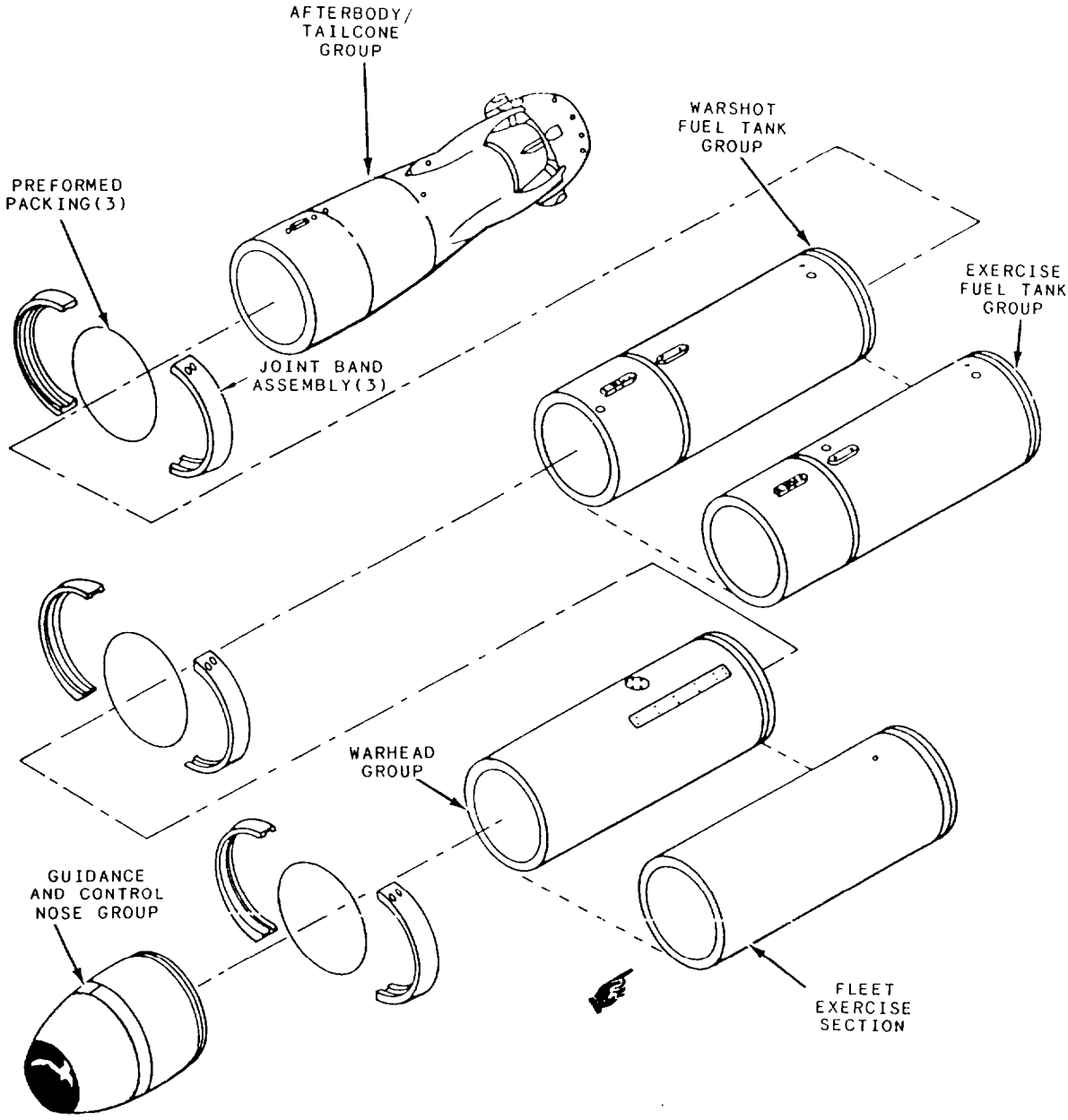


Figure 3-5.-Mk 48 ADCAP torpedo group configuration.

Mk 48 ADCAP (fig. 3-5). Now that we have looked at the two figures, we can visualize the groups as we discuss them. Let's get started.

We will use the Mk 48 as an example when discussing the maintenance, and when it is feasible, we will cover some of the differences between the Mk 48 and Mk 48 ADCAP. But due to the general nature of this book, this may not always be possible.

Nose Group

The first group we will discuss is the nose group (fig. 3-6) for the MK 48.

Before your initial torpedo assembly for system test, all nose group FIR units and cables

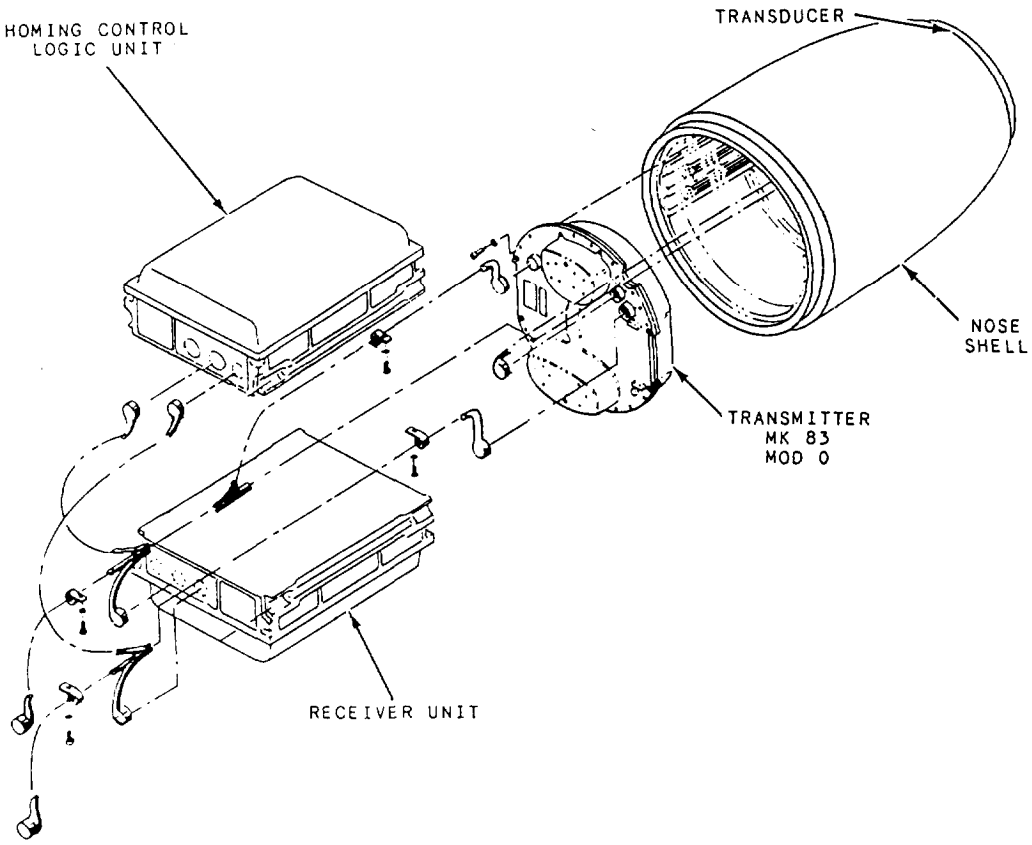


Figure 3-6.-Mk 48 nose group.

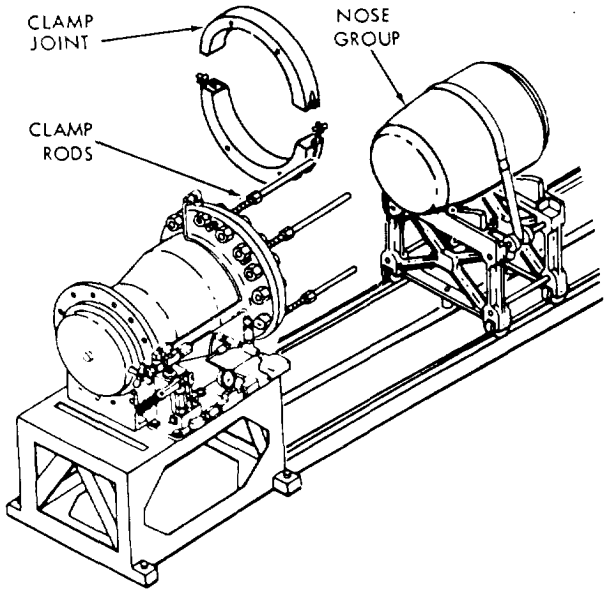


Figure 3-7.-Nose group in acoustic test stand.

are tested. Cables are checked using the applicable cable test set. FIR units are checked using the applicable system test set (ATE). The cables must be removed from the nose group and be installed on the cable test set for proper testing.

The transducer unit may be tested while installed or maybe removed from the nose shell. The transducer unit is tested with the ATE. The ATE includes an acoustic test stand (fig. 3-7), which is used to simulate an ocean environment during system test.

The transmitter unit can be FIR tested either while mounted in the nose shell or while separated from the nose shell. If it is tested while mounted in the nose shell, the homing control logic unit (HCL) must first be removed (if applicable) to make test cable connections.

The HCL unit must be removed from the nose shell and be placed on a rubber pad prior to testing. The rubber pad isolates the HCL case from earth ground during FIR testing.

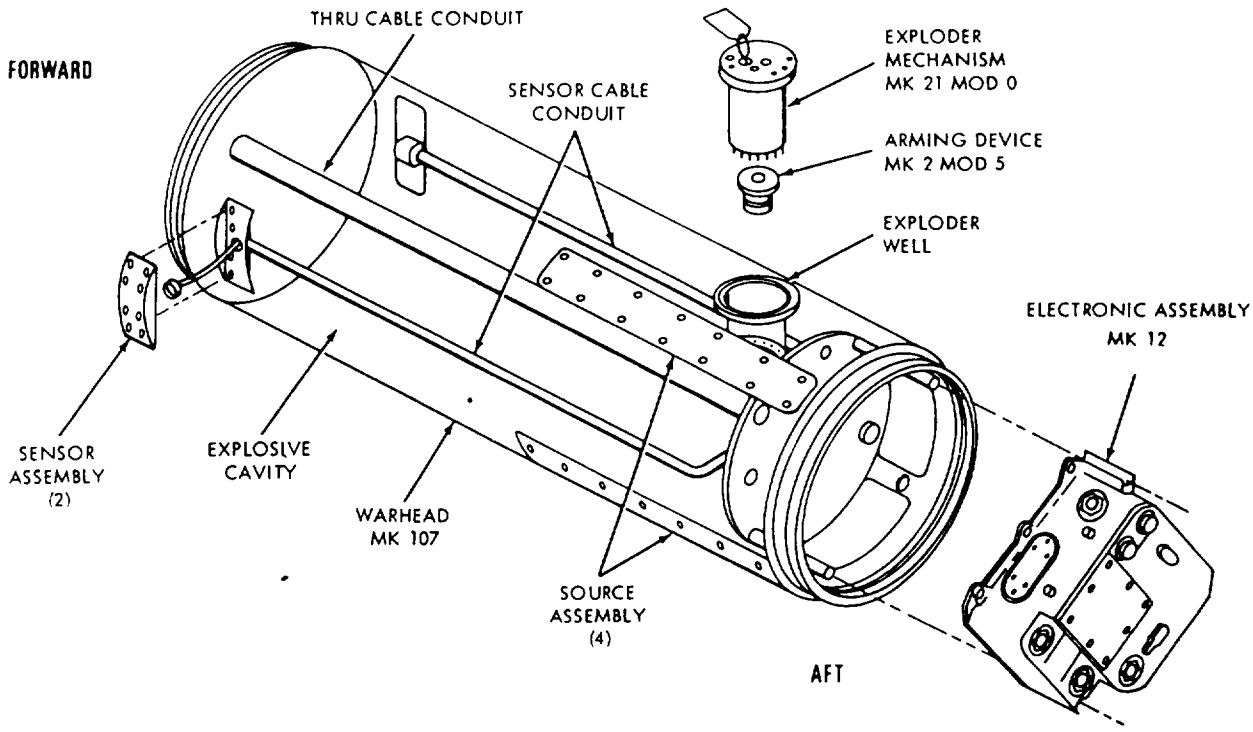


Figure 3-8.-Mk 48 warhead group.

Warhead Group

Next let's talk about the group that is responsible for inflicting damage on the enemy—the warhead group (fig. 3-8).

Before initial torpedo assembly for system test, some warhead group through cables and all FIR units are tested. Some cables are removed from the warhead group and are tested on the cable test set Mk 556 Mod 0. Cabling within the through cable conduit can be replaced by intermediate site maintenance personnel, if necessary.

The warhead, including the electronic assembly, is FIR tested using the system test set. The electronic assembly is cabled to the source and sensor assemblies and is mounted in the warhead shell for testing. The warhead coil test dolly is connected to the ATE to stimulate and monitor electronic assembly function via the source and sensor assemblies. In addition, an ATE exploder cavity adapter replaces the exploder mechanism and arming device. This adapter ensures that the warhead is safe since the adapter completes an interlock connection before FIR testing can begin. Figure 3-9 shows the warhead group FIR test setup.

The source and sensor assemblies can be replaced when required.

The exploder mechanism is FIR tested using the exploder mechanism test set Mk 525 Mod 1. The shape of the test cavity in the exploder mechanism test set Mk 525 Mod 1 ensures that the arming device is not attached to the exploder mechanism during exploder tests. The exploder mechanism will not fit into the test cavity with the arming device attached to it.

The arming device cannot be FIR tested at the intermediate maintenance level. The arming device is stored with a safety pin installed as shown in figure 3-10. An armed or defective arming device must be immediately reported to explosive ordnance disposal (EOD) personnel.

All Mk 48 and Mk 48 ADCAP torpedoes are issued by intermediate level shops with the exploder mechanism and arming device installed.

This completes our discussion of the warhead, and next we will discuss the brains of the weapon—the control group.

Control Group

If the control group FIR units (power control unit, gyro control unit, and command control

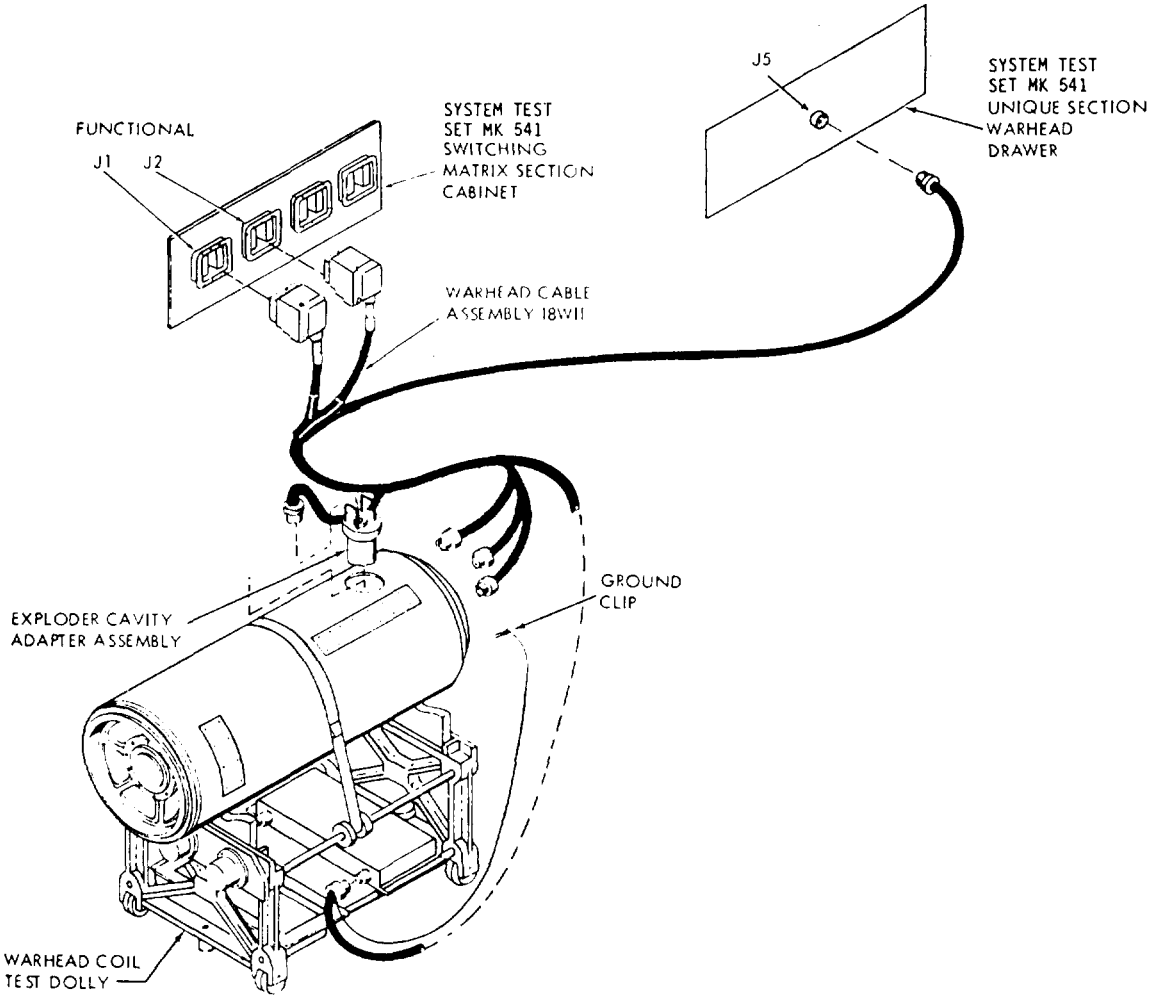


Figure 3-9.-Warhead group; FIR test setup.

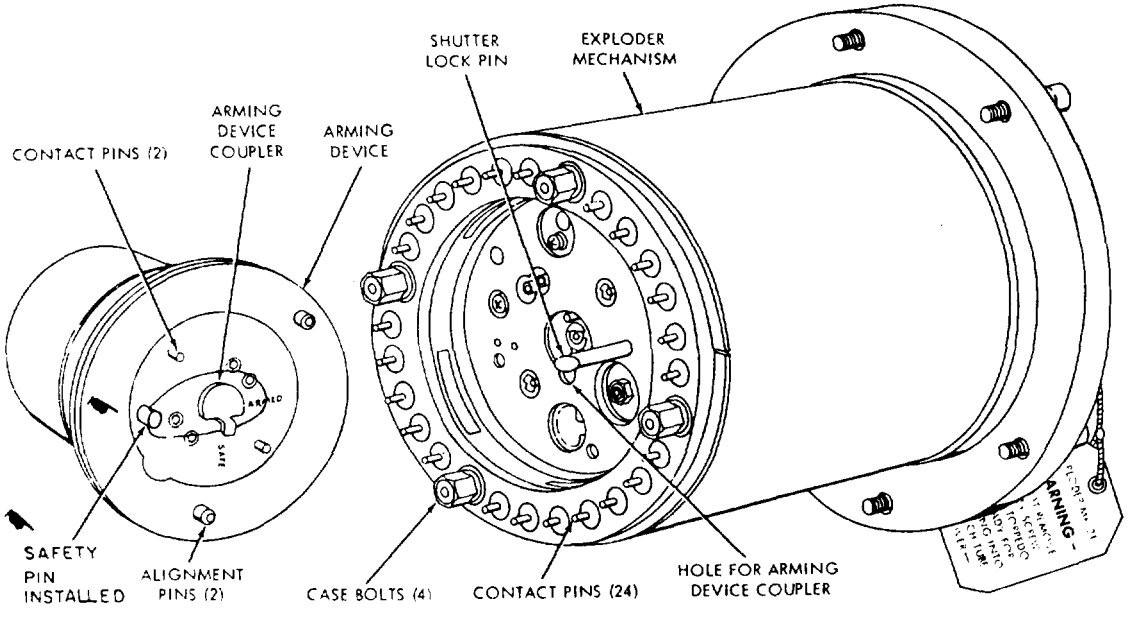


Figure 3-10.-Exploder mechanism and arming device.

unit, shown in figure 3-11) have been tested within 180 days, the group is ready for you to begin initial torpedo assembly (cabling the groups together) in preparation for the system test. If the gyro control unit requires FIR testing, the unit is removed from the group, installed on the gyro test table, and connected to the switching matrix section of the Mk 541 test set (fig. 3-12). Figure 3-13 shows the FIR test setup for the power control and command control FIR units. After

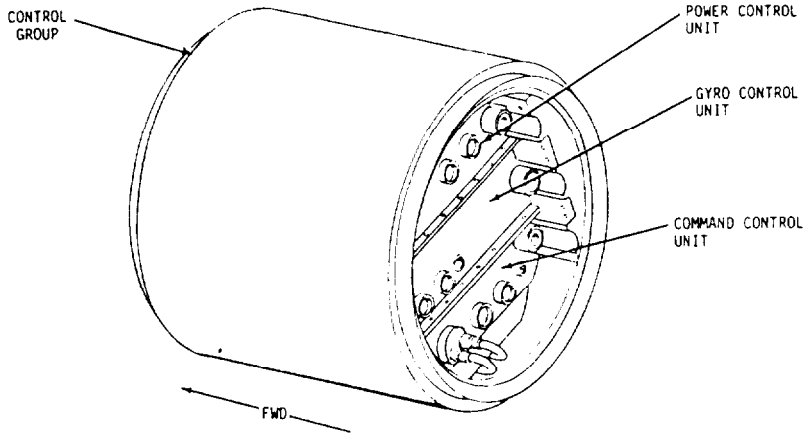


Figure 3-11.-Mk 48 control group.

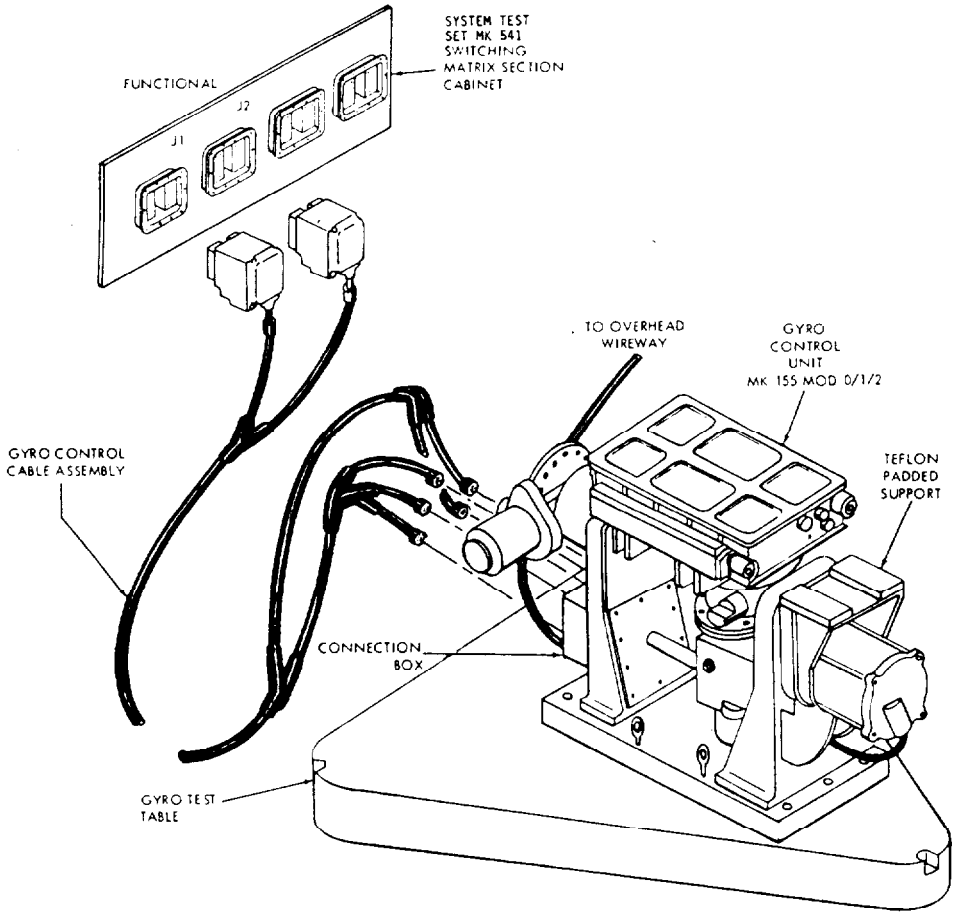


Figure 3-12.-Gryo control unit; FIR test connection.

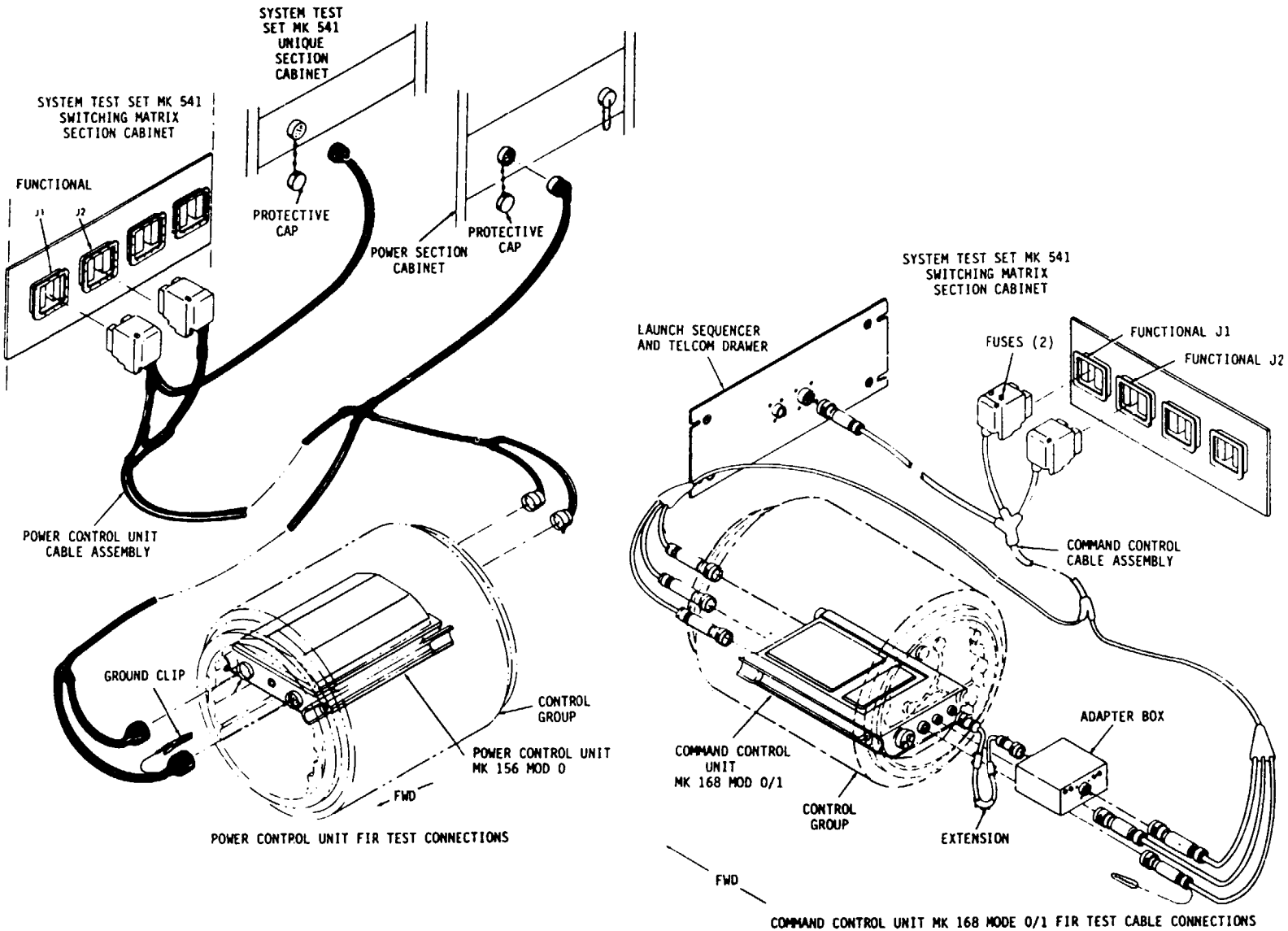


Figure 3-13.—Power control unit and command control unit; FIR test setup.

the units have been tested, the gyro control unit must be reinstalled in the control group. The control group cable assemblies must be tested with the cable test set Mk 556. They are connected during initial torpedo assembly.

Fuel Tank Group

Just like your car, the torpedo needs some type of fuel so that it can operate. The next logical area to be discussed is the fuel tank group.

Preparation of the fuel tank group for use in a warshot configuration includes you performing the following maintenance actions:

1. Installing the wire dispenser
2. Vacuum and leak testing the wire coil bulkhead
3. Testing the group cables with the Mk 556 test set
4. Vacuum leak testing the full range fuel tank
5. Monopropellant fueling
6. Performing turnaround (replacing packing and cleaning valve parts) and testing of the relief valve
7. Performing fuel leakage tests

The wire dispenser is mounted in the forward fuel tank wire dispenser chamber. A wire coil loading stand is used to support the dispenser

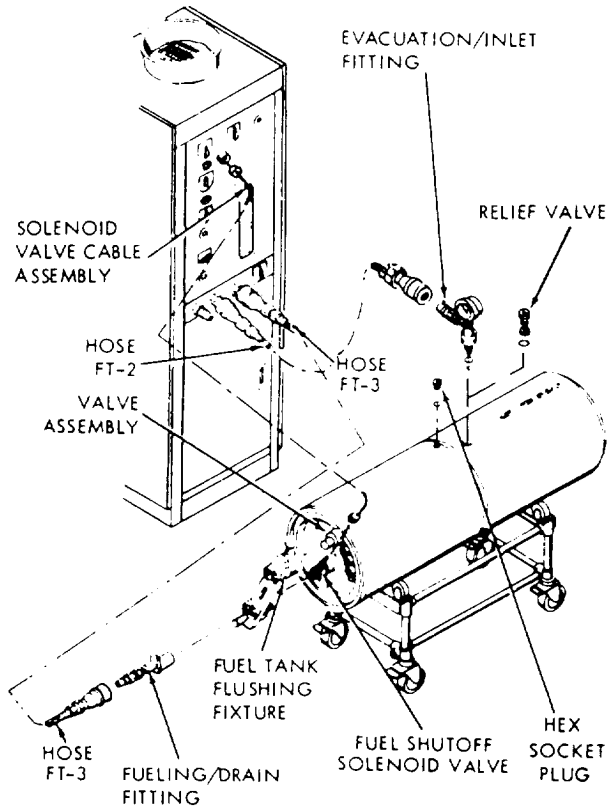


Figure 3-15.-Monopropollant fueling (warshot.)

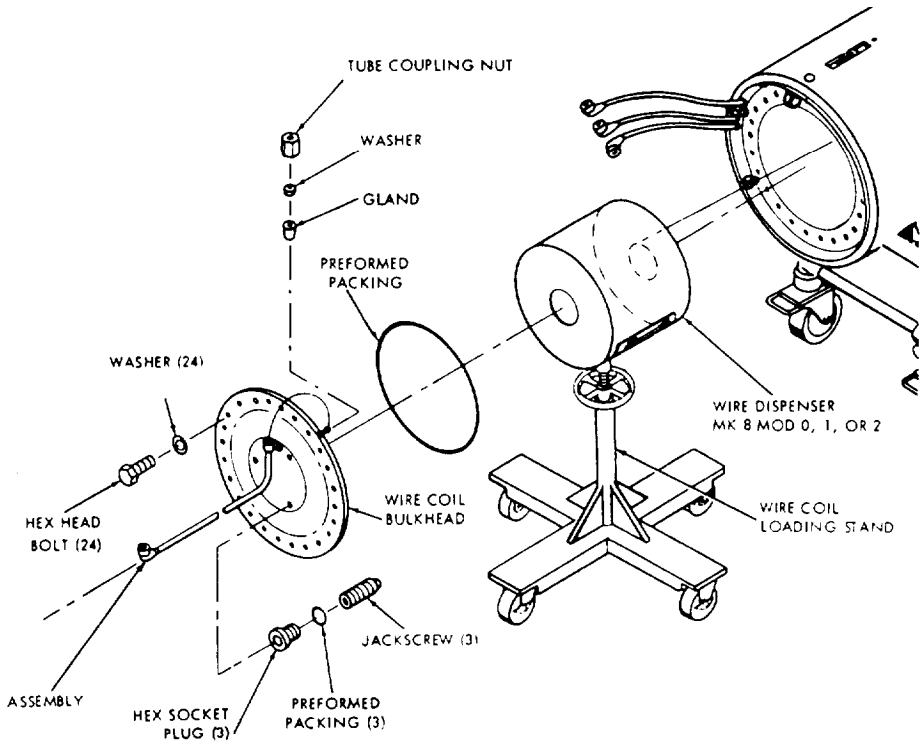


Figure 3-14.-Wire dispenser installation.

during installation (fig. 3-14). The wire dispenser is secured in place by the wire coil bulkhead. The dispenser contains a single conductor wire, which pays out from the torpedo after launch and links the launch vessel to the torpedo.

The Mk 6 Mod 0 fuel tank filling unit is used to vacuum check the wire coil bulkhead and the fuel tank compartments, and to fuel the fuel tank group. Figure 3-15 shows the fuel tank and fuel tank filling unit connections for fueling a tank to be used in a warshot configuration.

After all fueling procedures have been completed, the Mk 6 Mod 0 fuel tank filling unit is used to conduct the fuel tank cable conduit leakage test before initial torpedo assembly.

We will discuss a difference between the regular fuel tank and the extended range fuel tank. When an extended range exercise torpedo has been recovered and goes through a turnaround procedure, the aft fuel tank must be flushed prior to disassembly from the afterbody\tailcone. The fuel tank group must be defueled, cleaned, flushed out with fresh water and vacuum checked. The forward fuel tank is then refueled for another run. The flushing of the aft fuel tank is performed when the afterbody\tailcone and fuel tank group are joined together. Flushing, evacuating, and fueling of the forward fuel tank are all performed with the Fuel Tank Filling Unit Mk 6 Mod 0. Fuel tank cable tests are performed using the Cable Test Set Mk 556 Mod 0.

Afterbody\Tailcone Group

The last and possibly the most complex group we will discuss is the after\body tailcone.

To prepare the afterbody\tailcone group for a warshot (fig. 3-16), you must remove the

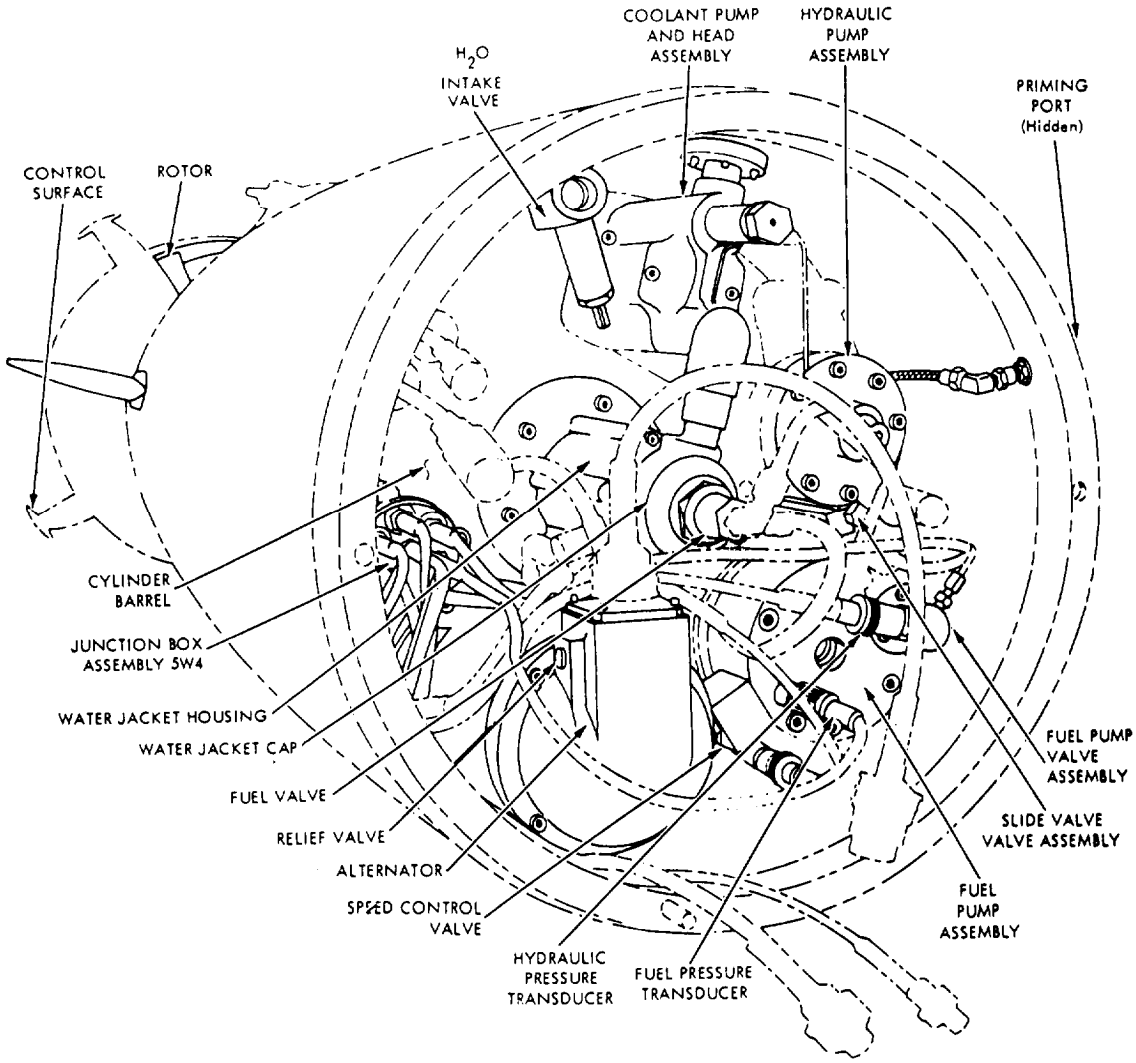


Figure 3-16.-Afterbody/tailcone group accessories.

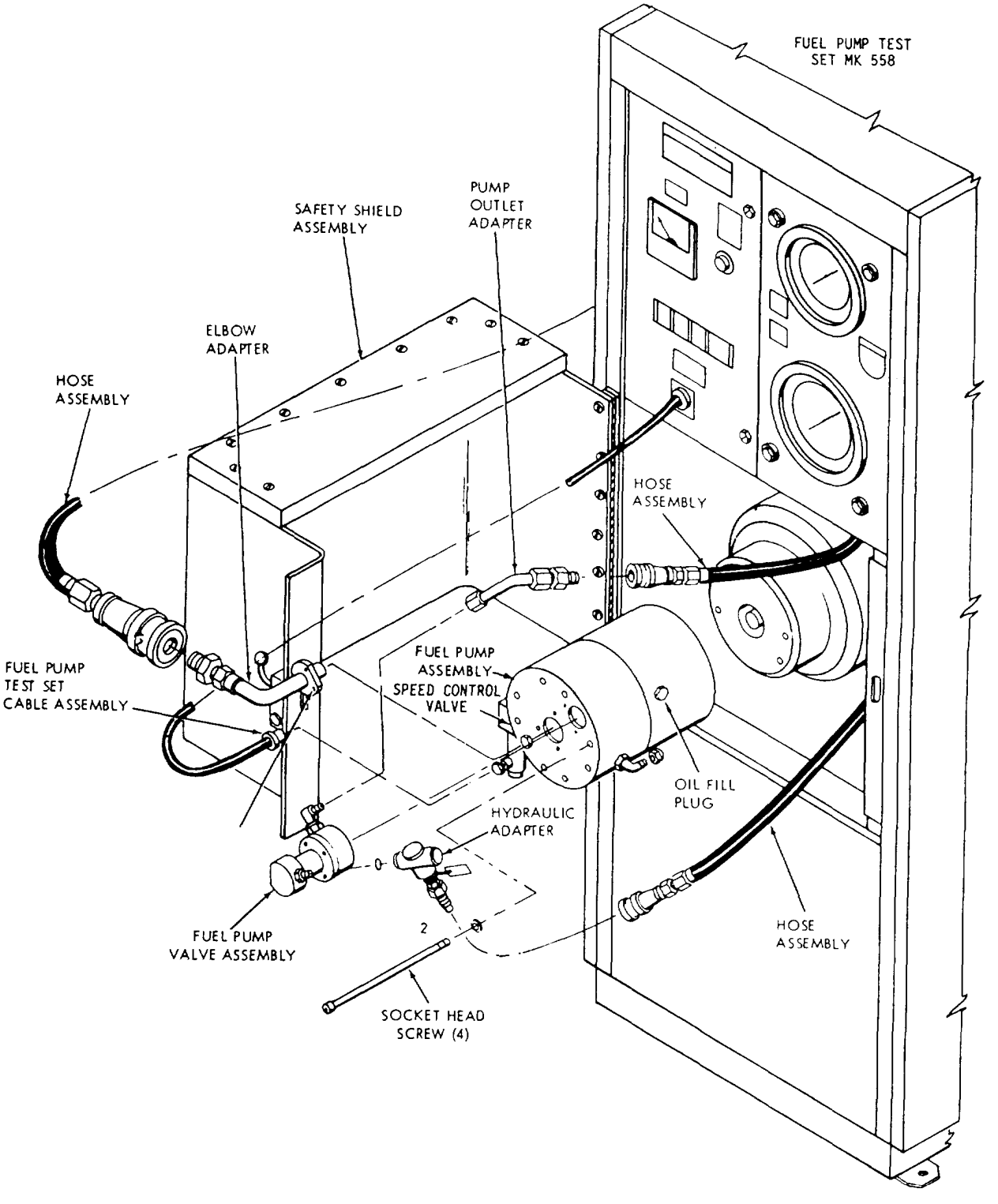


Figure 3-17.-Fuel pump/speed control valve test.

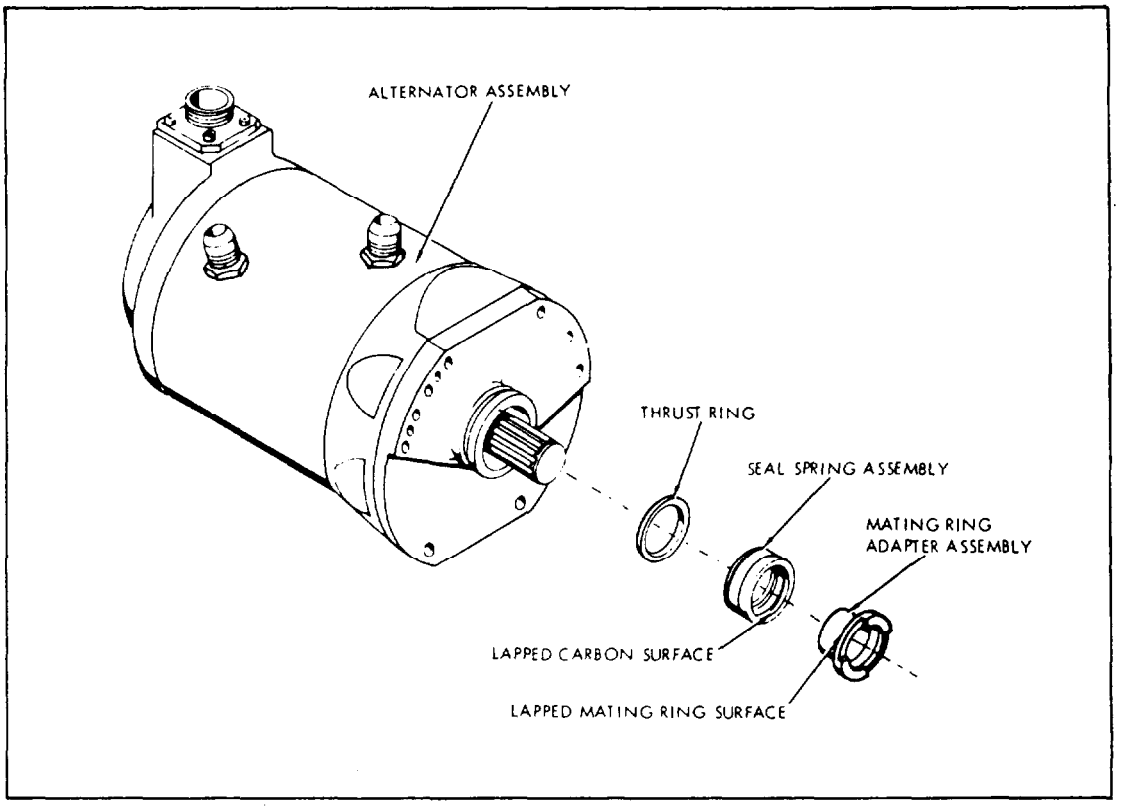


Figure 3-18.-Alternator sealol seal assembly; exploded view.

junction box assembly, alternator, fuel pump valve, and fuel pump. Then you will conduct continuity test on the afterbody\tailcone group cabIe assembly and junction box, FIR test the alternator, and test the fuel pump using a fuel pump test stand (fig. 3-17).

Before the alternator is FIR tested, the alternator sealol seal assembly (fig. 3-18) must be turned around or lubricated and the torques verified.

If the alternator has been run, the alternator sealol seal assembly must be removed and discarded; a new seal assembly must be installed and tested. Removal of the seal assembly must be reported on a Torpedo Management Information System (TMIS) Torpedo Maintenance Data Form (NAVSEA 8510/5). The serial numbers of the alternator and the new sealol seal assembly must be entered in the report. Entries stating that the seal assembly was removed and discarded must be made on the component history cards of the alternator and alternator sealol seal assembly. The sealol seal assembly component history card should be forwarded with the Torpedo Maintenance Data Form. The serial number of the replacement seal must be entered on a new component history card for the alternator. If the alternator has not been run, the sealol seal assembly is not removed.

Lubricating the seal and checking the torque of the seal and rotor shaft are the only maintenance you are required to perform before FIR testing the alternator.

After FIR testing the alternator using the Mk 541 test set, remove and test the relief valve (fig. 3-16). Then, perform a vacuum leak test on the alternator and reinstall the relief valve.

While you have the components removed from the afterbody\tailcone group, the velocity sensor switch (located inboard of the top damping vane,

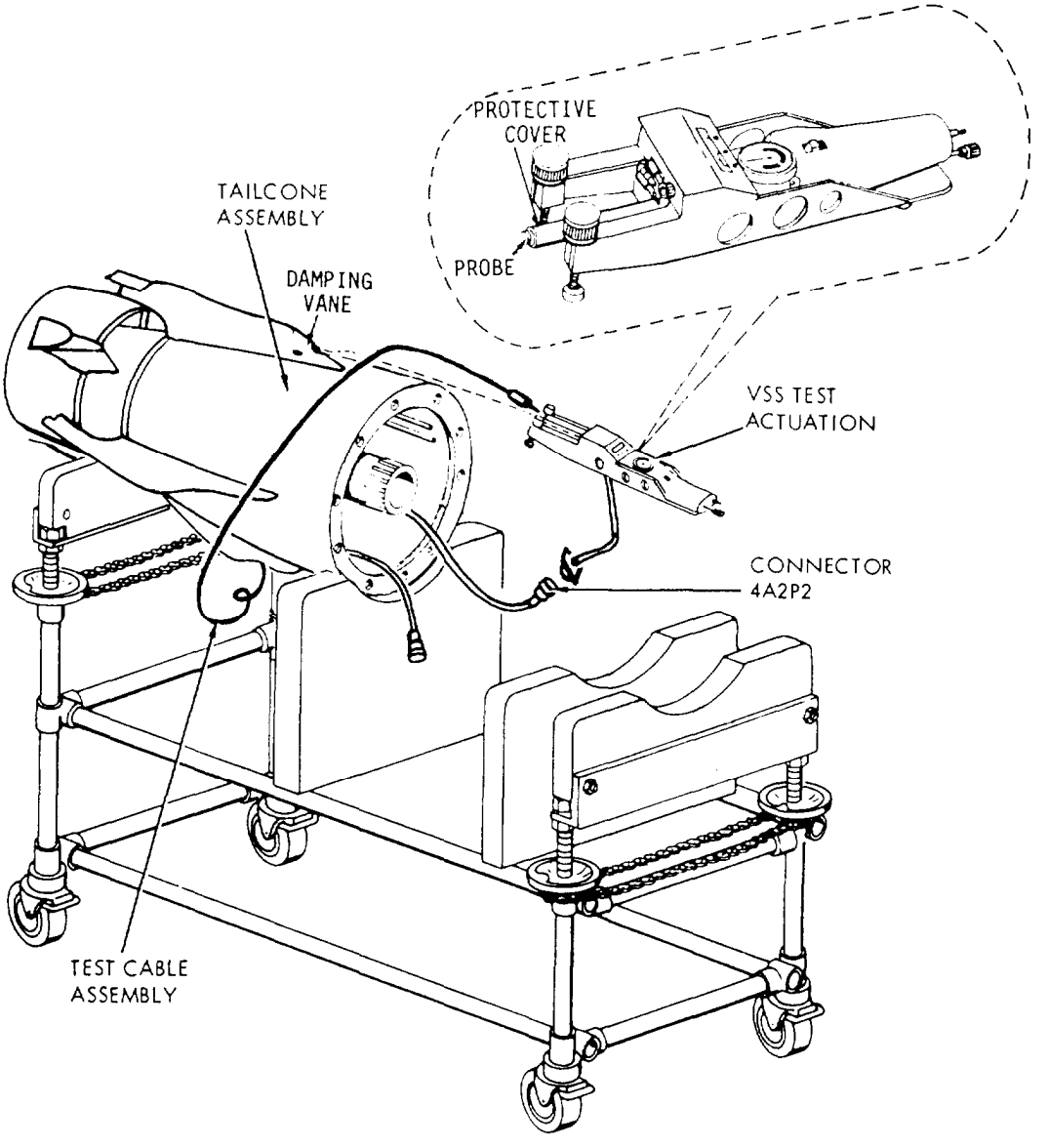


Figure 3-19.-Velocity sensor switch test.

figure 3-19) must be operationally tested with the test actuator to ensure that an unlock signal is transmitted to the unlock circuitry in the warhead exploder. This signal will permit exploder arming.

After the accessories and cables have been satisfactorily tested, the junction box assembly, alternator, fuel pump valve, and fuel pump must be reinstalled in the afterbody\tailcone. The hydraulic system must be drained, evacuated, and filled with hydraulic fluid (fig. 3-20). The engine crankcase must be filled with lube oil (fig. 3-21) and the chamber and valve assembly must be installed.

The chamber and valve assembly contains a Class C electroexplosive device (EED) and must be handled as directed by applicable technical manuals and local safety instructions. Safety glasses, grounded wrist stat, and flame-resistant clothing must be worn by personnel handling the assembly.

A new or refurbished chamber and valve assembly is required for every torpedo during

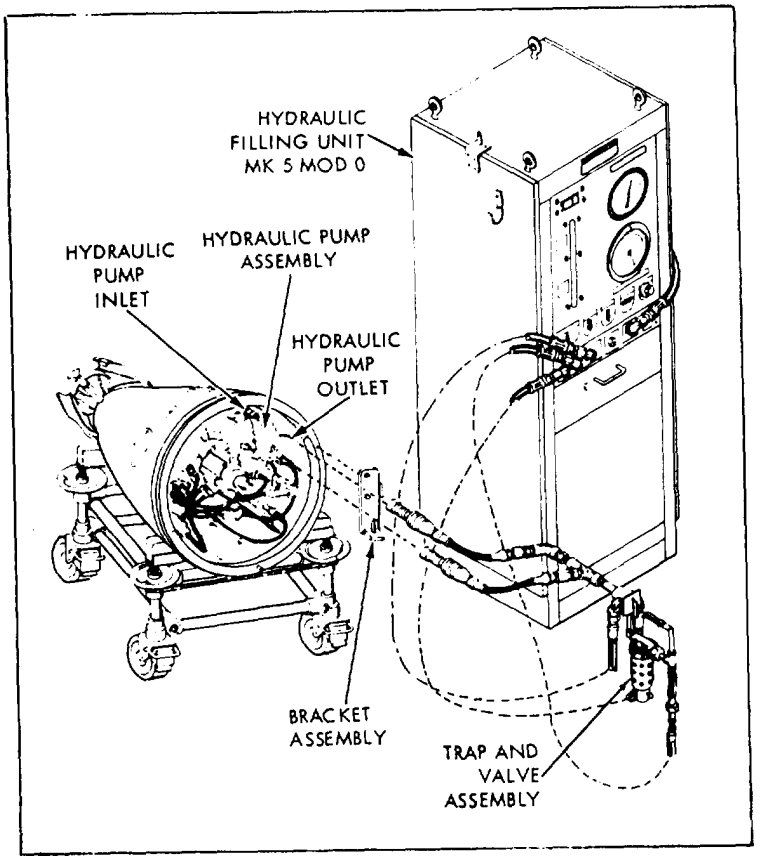


Figure 3-20.-Hydraulic system; drain, evacuate, and fill.

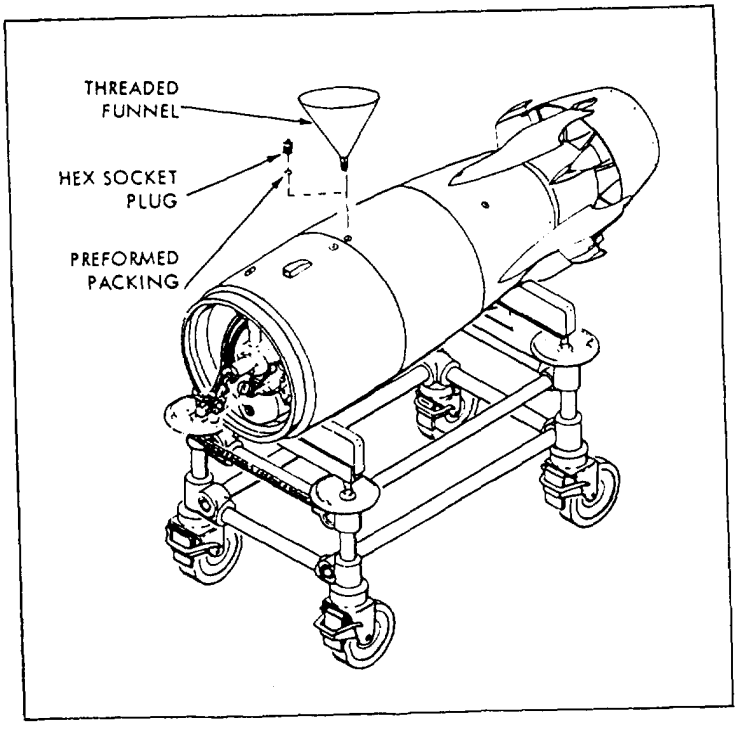


Figure 3-21.-Engine oil; fill.

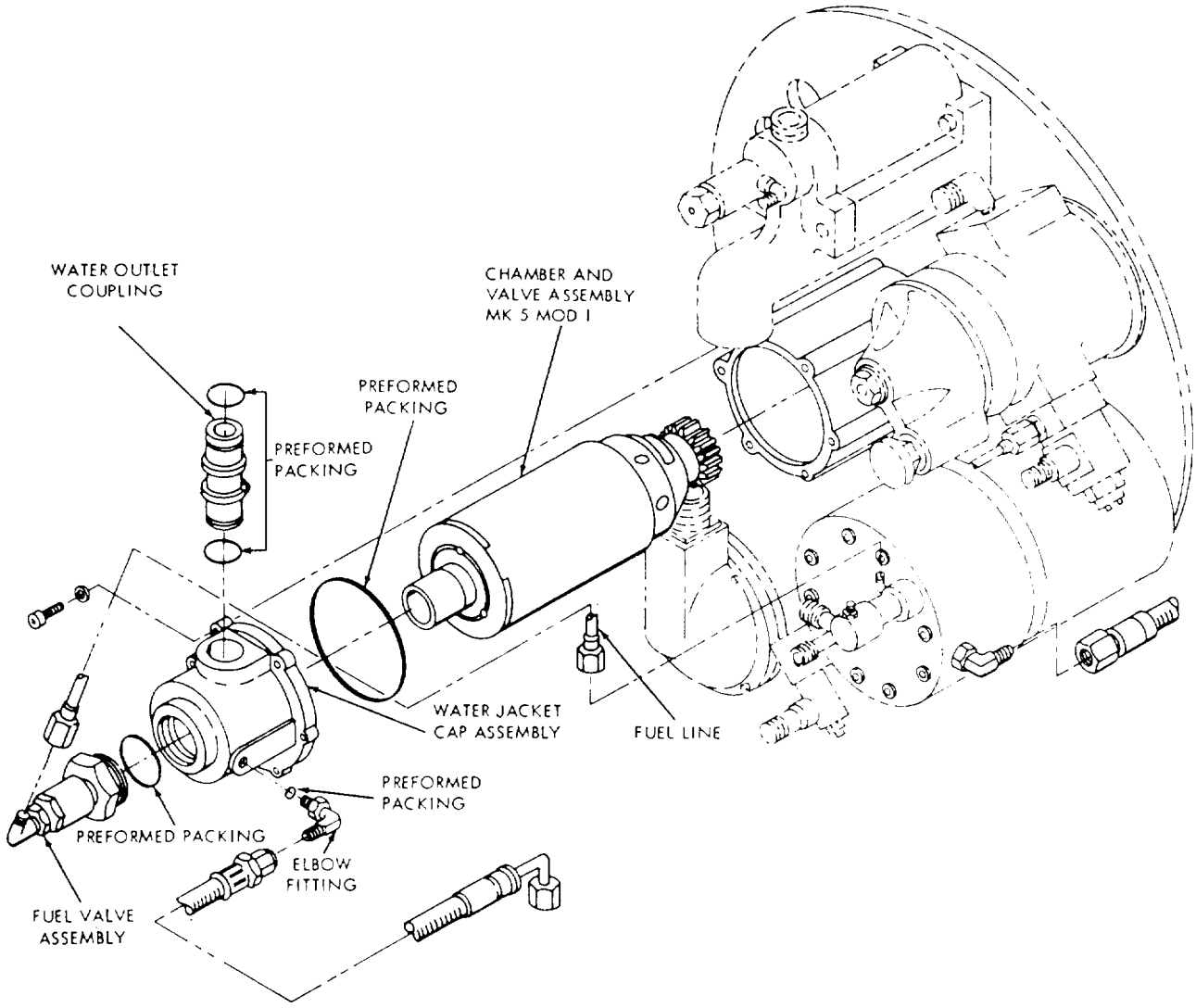


Figure 3-22.-Chamber and valve assembly installation.

warshot preparation. To install the assembly, remove the fuel valve and water jacket cap (fig. 3-22). During reassembly, install new packings.

When the fuel valve, water jacket cap, and chamber and valve assembly are drawn from stock, the information on the component history cards must be inspected for correctness, and all serial numbers must be verified. The components must be checked for contamination and for shipping and handling damage.

After installation of the chamber and valve assembly, an operational test of the afterbody\tailcone group must be conducted. Figure 3-23 shows the accessory connections for the test. The operational test involves rotation of the engine to open and close valves in the forward afterbody compartment. While the engine is rotating, operation of the coolant pump inlet valve, water intake valve, fuel pump valve, and hydraulic pressure must be observed. Flush-pin gauge assemblies are used to monitor the operation of the coolant pump and water inlet valves (fig. 3-23). Valve operation is indicated by the gauge pin protruding from the adjustable bushing on the gauge assembly (fig. 3-24). The hydraulic pressure line slide valve, provides the hydraulic pressure to open the fuel pump valve, is operated by 24-volt dc from the afterbody test set. Operation of the fuel pump valve

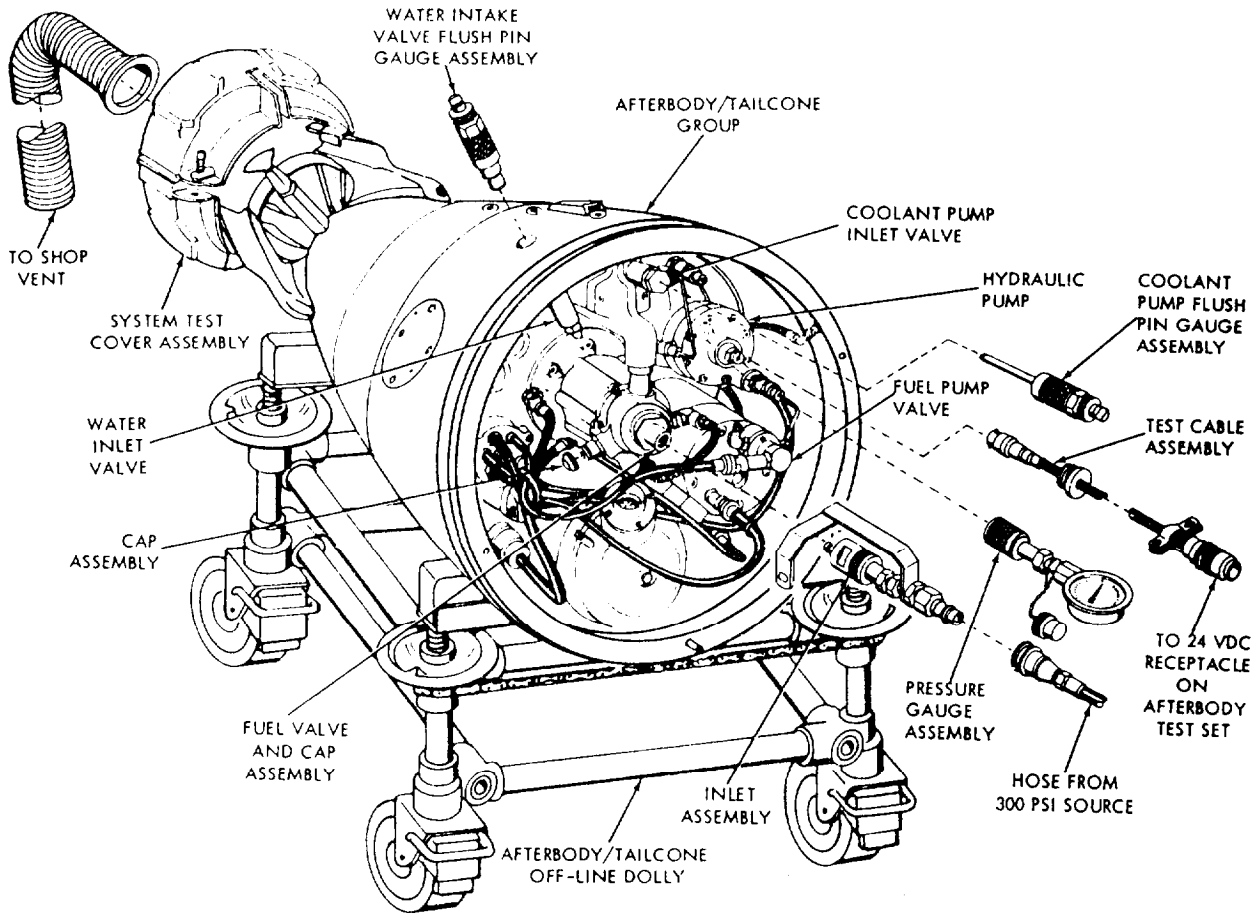


Figure 3-23.-Afterbody/tailcone accessory connections for operational test.

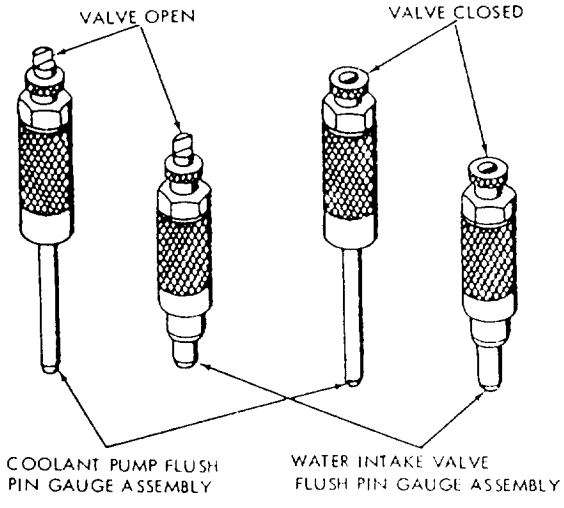


Figure 3-24.-Flush pin gauge assemblies.

spring can be observed through a hole in top of the fuel pump valve.

An accessory vacuum leak test and a continuity test of the igniter are also part of the group operational test. After the operational tests are completed, a back pressure test is conducted to check the water intake valve for leakage, and dummy transducers are installed in place of the fuel and hydraulic pressure transducers shown in figure 3-16.

Initial Torpedo Assembly and System Tests

Now we are ready to start putting all of these groups together and testing them as one unit.

During the initial assembly of the torpedo, the group cables are inspected and connected; the command wire guide tube is inserted in the

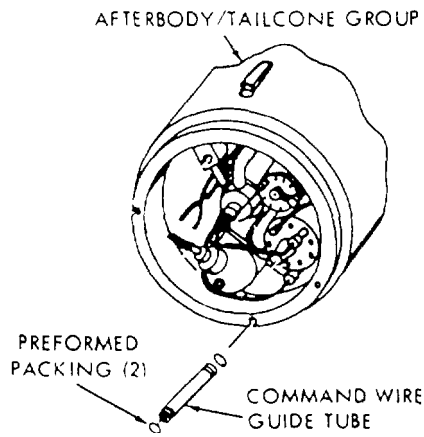


Figure 3-25.-Command wire guide tube installation in the afterbody/tailcone group.

afterbody\tailcone (fig. 3-25); and the command wire is fed from the fuel tank through the guide tube until the wire extends approximately 2 feet beyond the fairlead. You may find this takes some practice to do. The command wire is then fed through the hole in the bottom half of the system test cover assembly.

After you have cabled the various groups together and the test connections are made between the Mk 541 test set and the torpedo (fig. 3-26), the torpedo is system tested. During the system test, the warhead group and afterbody\tailcone group must be grounded to an ordnance ground except when otherwise instructed by the job sheet.

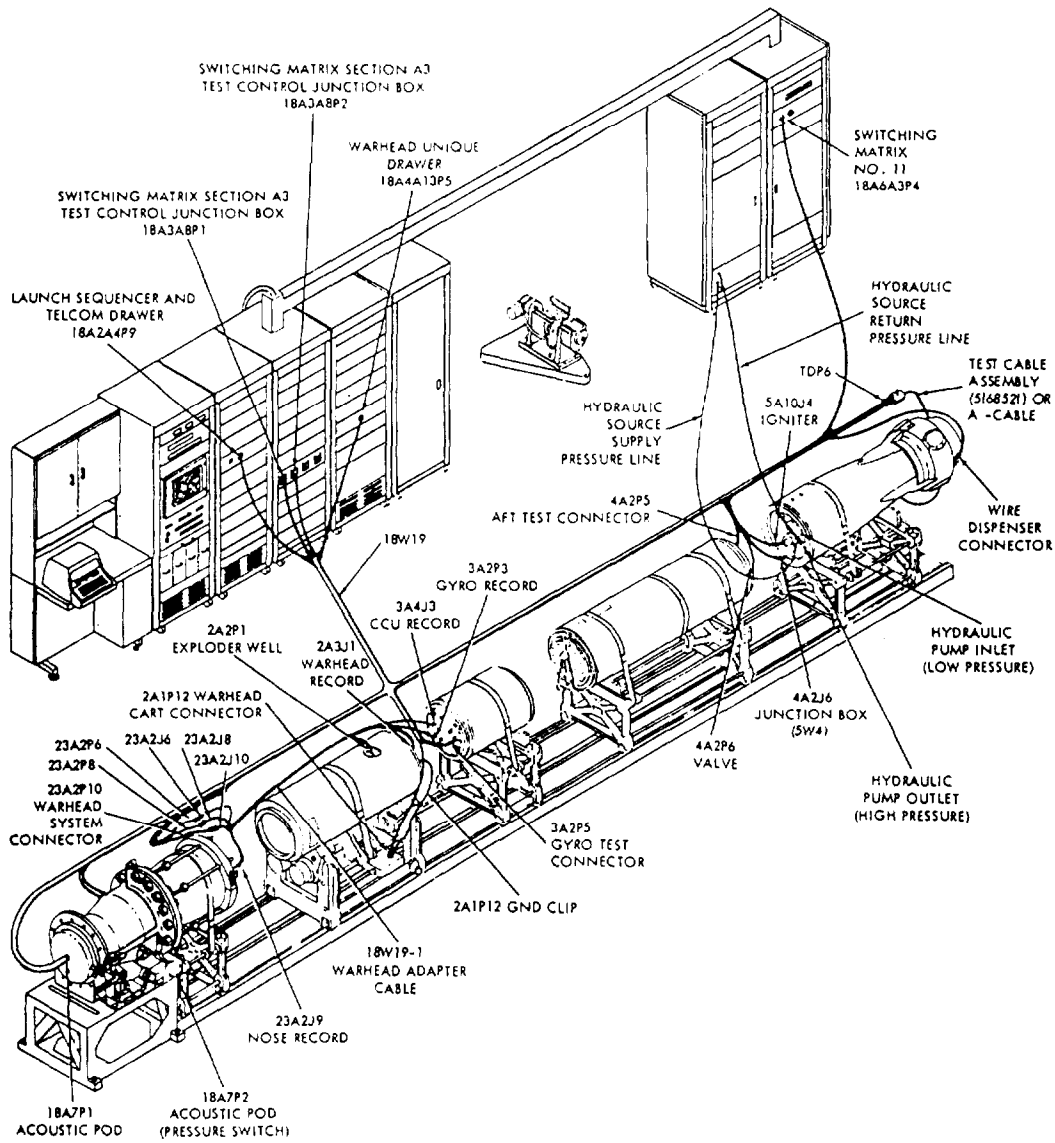


Figure 3-26.-Test connections for warshot torpedo system test.

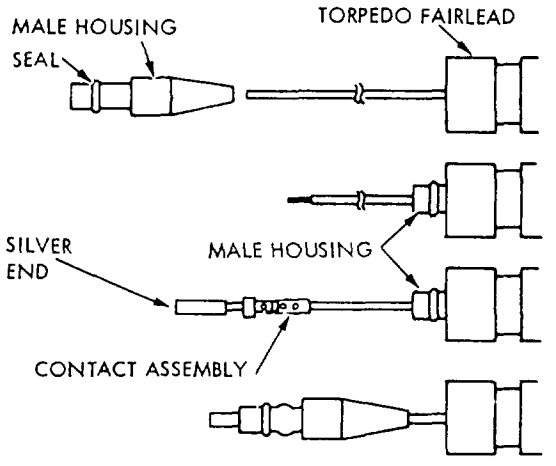


Figure 3-27.-Wire splice.

You must strictly follow the job sheet for doing the system test because deviations could result in costly equipment damage. The test set operator must understand that if a required indication or action does not occur, or is not understood, the supervisor must be contacted for instructions before proceeding with the test. Any irregularity must be immediately reported.

After you start a test program, it may be interrupted only under the following conditions:

1. If continued test set operation will result in injury to personnel
2. If continued test set operation will result in damage to equipment
3. If the job sheet or the test set teleprinter specifically provides for an interruption

Final Torpedo Assembly

We are now ready for the final stage prior to shipping the weapon out.

When the system test has been satisfactorily completed, the torpedo hydraulic system must be drained, evacuated, and filled. The torpedo groups are then assembled together and the torpedo is vacuum leak tested and backfilled with nitrogen. A male housing is installed on the command wire and a contact assembly (for connecting the command wire to the TMD is spliced to the command wire [fig. 3-27]). The fuel pump must be primed with a minimum of 3- 1/2 ounces of Otto Fuel II. The priming fixture (fig. 3-28) must be filled in the fueling area. Only those personnel that are qualified to handle Otto Fuel II and are familiar with the contents of the

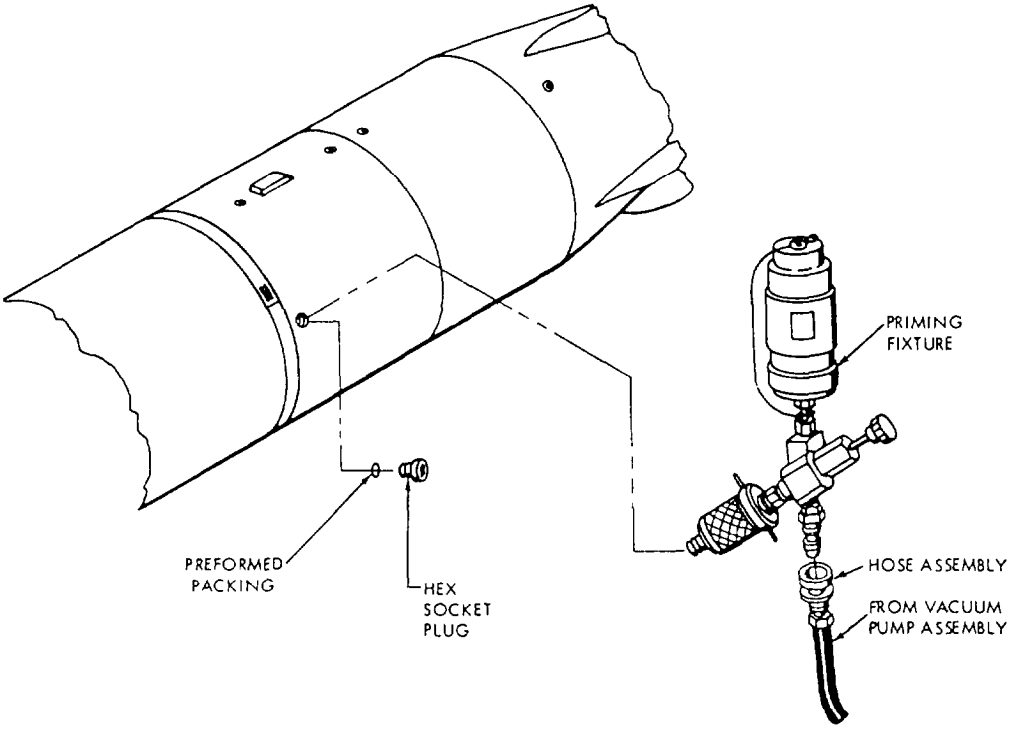


Figure 3-28.-Fuel pump priming.

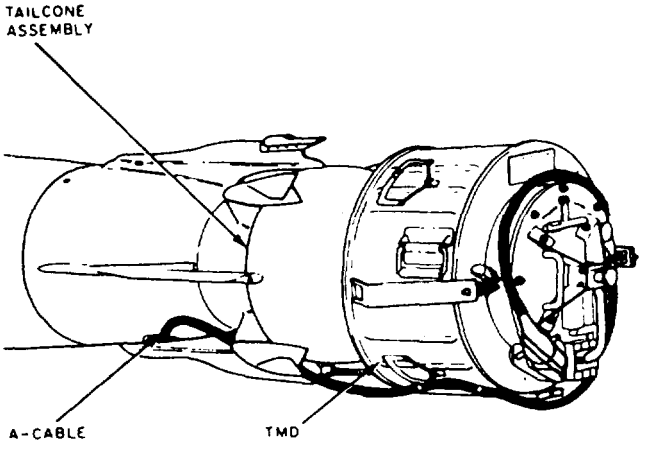


Figure 3-29.-Torpedo mounted dispenser (TMD) attached to a Mk 48 torpedo.

applicable technical manuals concerning OTTO Fuel II should be tasked with priming the fuel pump.

After you have primed the fuel pump, you must take the following actions:

1. The amount of fuel used to prime the fuel pump must be recorded on the QA sheet.
2. A sticker labeled PRIMED must be placed alongside the vacuum port.
3. A tested exploder and arming device must be installed in the warhead group.
4. A TMD must be mounted on the torpedo (fig. 3-29).
5. A readiness inspection must be conducted on the torpedo. If there are no deficiencies, the torpedo is ready for issue.

In chapter 5 we will discuss the maintenance requirements for some of the various test equipment required to support the maintenance and testing of the Mk 48 and the Mk 48 ADCAP. Therefore, our next set of topics will only cover the responsibilities, philosophy, and guidance concerning the maintenance of the associated support equipment.

WSE/ISSE Maintenance

The workshop support equipment and in-service support equipment (WSE/ISSE) installed at each IMA encompasses equipment that you will be required to test, disassemble, service, assemble, and calibrate. It is comprised of special-purpose test equipment, workshop tools, workshop handling equipment, and weapons handling equipment. Detailed descriptions, procedures, and data pertaining to the operation and maintenance of WSE/ISSE at IMAs are contained in the technical manuals listed in section 9 of NAVSEA OD 45814.

Within the scope of IMA provisioning and technical documentation, maintenance of the Mk 48 torpedo WSE installed at each IMA is the responsibility y of shop personnel. However, during repairs of the Mk 48 WSE, the practice of interchanging components between test and measuring equipment to aid in troubleshooting and fault isolation is not encouraged and is only allowed if specifically authorized by local command instructions.

For the Mk 48 ADCAP torpedo ISSE installed at each IMA, the responsibility belongs to the shop and the contractor until it is totally transitioned to Navy support.

Calibration Support

WSE/ISSE and WSE/ISSE subassemblies requiring periodic calibration, testing, and servicing have been integrated into the Navy's calibration program at each IMA. A listing of Mk 48 and Mk 48 ADCAP torpedo WSE/ISSE calibration requirements is contained in FCA *Metrology Requirements List,* NAVSEA OD 45854. This publication contains information on

Table 3-2.-FCA Code Assignments

ACTIVITY	CODE
SUBASE, Pearl Harbor (Code 090)	LYQ
NAVSUBSUPPFAC, New London (Code 800)	NWQ
SUBASE, San Diego (Code 03)	ZDQ
NUWES, Keyport (Code 502)	KEQ
SUBTORPFAC, Charleston	CLQ
SUBTORPFAC, Yorktown	YWQ
SERVSCOLCOM, Orlando (23C)	ODQ

calibration standards and test instruments required at IMAs. It also identifies specific WSE/ISSE authorized for calibration by IMA personnel/calibration laboratories. Each IMA has been designated as a field calibration activity (FCA) Phase H-4 facility and is assigned a three-letter FCA code. Table 3-2 identifies the FCA code assignment for each IMA. All test, measuring, and diagnostic equipment shall be labeled by the local FCA in accordance with NAVELEXINST 4355.2 to identify calibration status. Calibration intervals are also listed in FCA *Metrology Requirements List,* NAVSEA OD 45854. FCA Phase H-4 facilities (IMAs) shall participate in the Naval Sea Systems Command Calibration Management Information System (SEACALMIS) program, as defined in NAVSEA-INST 4855.11.

CONTAINER MAINTENANCE

The repair of containers is covered by *Ordnance Requirement,* OR-99, and consists of replacement of mechanical parts and those repairs falling within the capabilities of the activity. Descriptions of containers used for the torpedo and torpedo components are presented in OP 4027 for the Mk 48 torpedo and in ST890-AY-PRO-010 for the Mk 48 ADCAP torpedo. Replacement parts for container maintenance are listed in the appropriate COSAL document. Repairs that are beyond IMA capabilities will be accomplished at Navy Depot Repair Facilities: NUWES Keyport, NWS Charleston, and NWS Yoktown.

SPECIAL TOOLS

Special tools required as a result of technical manual job sheet changes will be supported by the Navy supply system for the Mk 48 torpedo. NUSC will provide special tooling support for the Mk 48 ADCAP torpedo until the Mk 48 ADCAP support completes transition to the Navy supply system.

MK 48 TORPEDO DEPOT LEVEL MAINTENANCE

Mk 48 torpedo depot level maintenance support is provided by t he Navy. A Navy-operated depot level maintenance facility has been established at NUWES, Keyport. Depots for maintenance of the TMD, Mk 10-0 are located at NWS Charleston; NUWES Keyport; SUBASE Pearl Harbor; SUBASE New London; and SUBASE San Diego.

Mk 48 Torpedo Deployed Shelf Life Evaluation (DSLE) Program

During fleet operations, certain heavyweight warshot torpedoes will be selected to be part of the Mk 48 Torpedo Deployed Shelf Life Evaluation (DSLE) Program for disassembly, testing, and inspection to a greater degree than that required for normal warshot verification. The purpose of this action is to allow reliability, maintainability, shelf life, and quality aspects of production to be more closely examined and to be recorded. Torpedoes selected for extensive verification are designated by Ship's Parts Control Center (SPCC).

Mk 48 Torpedo Warshot Depot Maintenance (WDM) Program

The WDM program will assure that the reliability and asset readiness posture of Mk 48 torpedoes is maintained by performing periodic depot maintenance. This periodic depot maintenance will refurbish weapons as close to factory new condition as possible and incorporate design improvements. Torpedoes received from the fleet will be complete all-up warshots, which will be processed through the WDM processes and reissued as Mod 1 or Mod 4 torpedoes. Approximately 240 fleet torpedoes will be cycled through NUWES depot each year to receive maintenance upgrade processes and ORDALTing to the approved WDM program baselines. Returned torpedoes shall meet the following criteria. The oldest REBIT **(Reliability Enhanced Baseline Improved Torpedo)** warshot exercise torpedoes that have reached their limit, 10-15 in-water runs, are to be shipped first. Due to funding constraints, IMAs will use a 4-to-1 ratio (warshot to exercise [Fired]) when making shipments to NUWES. All shipments are controlled by SPCC and if a situation arises when an IMA cannot meet this criteria, the IMA shall request guidance from SPCC (Code 8533). Torpedoes will be returned in an all-up warshot configuration. IMA will identify and attach a completed copy of the form illustrated in

REGISTER NO.	YES	NO	UNKNOWN
WARSHOT NEVER ISSUED FROM IMA			
WARSHOT ISSUED TO TENDERS/SHOREBASE			
ISSUED TO SUBMARINE AS WARSHOT			
• WAS TORPEDO TUBE LOADED			
ISSUED AS EXERCISE TORPEDO			
STATUS OF PREVIOUS EXERCISE TORPEDO			
• EXERCISE TO WARSHOT TURNAROUND COMPLETED PER OP _____			
• AB/TC TURNAROUND COMPLETED PER OP _____ NO FURTHER TESTING BEFORE SHIPPING			

- KNOWN DEFECTIVE COMPONENTS (LIST)
  -
  -
  -
  -

Figure 3-30.-Torpedo history since REBIT configured.

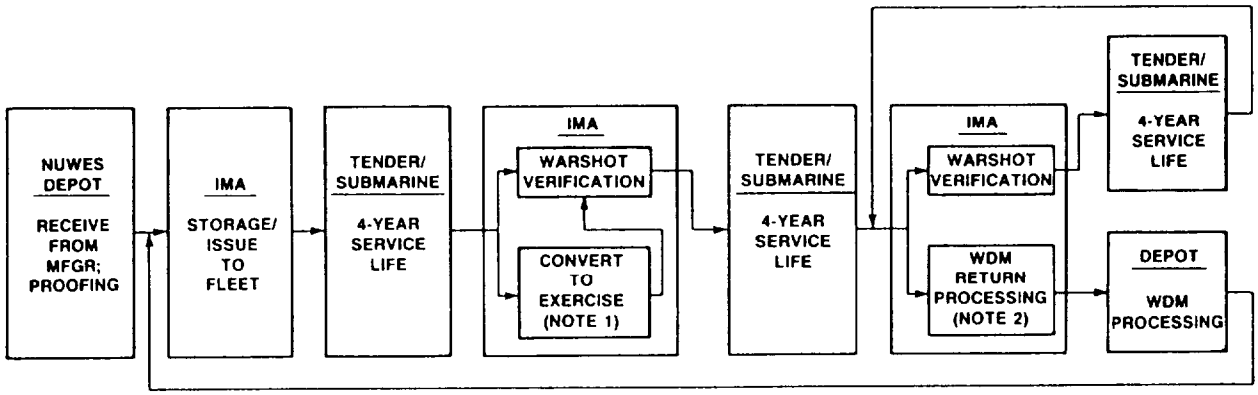
figure 3-30 for each torpedo being returned to NUWES for the WDM program. IMAs are restricted from any form of cannibalization of components; however, they may exchange defective depot level repair (DLR) components for RFI material in WDM returned weapons, but they must annotate it on the component history card and complete a green quality assurance tag. A WDM program flow chart is provided as figure 3-31.

Return of Damaged Torpedoes

IMAs must not ship torpedoes that have sustained major damage due to handling accidents or internal salt-water flooding as WDM return weapons. When a torpedo sustains major damage, place it in condition code F. Enter it in the Down Torpedo Reporting System (see section 5 of NAVSEA OD 45814) as requiring depot repair, and request disposition from SPCC (Code 8533) by message. This information should be sent to Commander Naval Sea Systems Command (COMNAVSEASYSCOM), within 24 hours of discovery of the damage.

Mk 88 Exercise Head Depot Refurbishment Program

The NUSC Mk 88 exercise head (Torpedo Instrumentation and Exercise Section [TIES])



NOTES:

1. Randomly selected fleet return warshots are converted to exercise weapons by IMAs. Exercise torpedoes may make up to 10 in-water runs before conversion back to warshots. Torpedoes must receive WDM processing before they can again be used for exercise. See OP 4024 Volume 1 Chapter 2 REBIT/WDM philosophy.

2. WDM return weapons selected by IMAs per the WDM program plan. Shipment controlled by SPCC (Code 8533).

Figure 3-31.-Mk 48 torpedo WDM flow chart.

Refurbishment Program Plan describes the flow of 40 TIES per year through the NUWES depot for refurbishment. Fleet IMAs will ship TIES as SPCC (Code 8533) directs.

Under this program, fleet IMAs may not cannibalize TIES being returned for refurbishment. Returned exercise heads must contain all their parts and components. Failed DLR components may be installed in TIES units being returned to the depot, provided that TMIS forms are submitted to document the known defective material, and the TIES component history cards are annotated to show the existence of the defective parts. Additionally the inclusion of known defective material is indicated on the green quality assurance (DD 1577-2) tags attached to the TIES and their containers.

TORPEDO MK 48 TORPEDO ADCAP DEPOT MAINTENANCE

The Mk 48 ADCAP torpedo depot level maintenance support is provided by WECO, HAC, and the Navy. Components and equipment common to both the Mk 48 and Mk 48 ADCAP torpedoes are supported by the Navy using existing support procedures in place for the Mk 48. The primary contractor depot is located at WECO, Cleveland, Ohio.

The Navy Depot for the Mk 48 ADCAP torpedo is designated at NUWES, Keyport, Wash.

Depot level maintenance and repair support of the following ISSE is accomplished by the contractor until transition is completed:

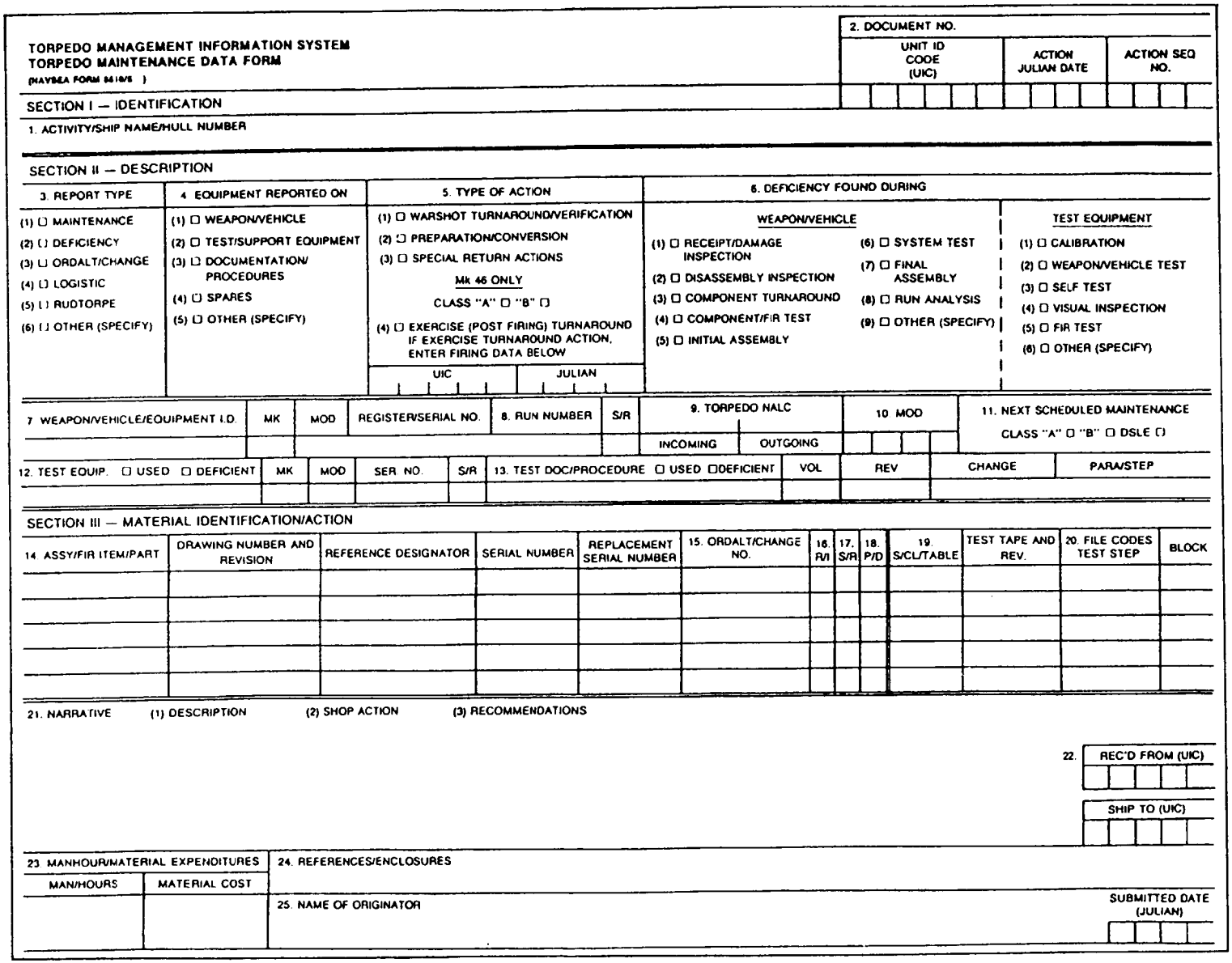
1. System Test Set, Mk 660, Mod 0
2. Fleet Data Reduction System, Mk 23, Mod 0
3. Calibration Console, Mk 125, Mod 0
4. Fuel Delivery Assembly Test Set, Mk 658, Mod 0
5. Steering Assembly Test Set, Mk 659, Mod 0

The contractor will also be responsible for the following interim support equipment:

1. Guidance and Control (G & C) Test Set
2. Instrumentation/Exercise and Warhead Subsystem Test Set
3. EESTS Test Set

RECORDS AND REPORTS

Records are required to be maintained in order that a complete history of significant events occurring during the life cycle of each heavyweight torpedo may be recorded. Secondly, these recording serve to maintain accountability of the major serialized components comprising the



TORPEDO MANAGEMENT INFORMATION SYSTEM
TORPEDO MAINTENANCE DATA FORM
(NAVSEA FORM 8510/5)

2. DOCUMENT NO.
UNIT ID CODE (UIC) | ACTION JULIAN DATE | ACTION SEQ NO.

SECTION I — IDENTIFICATION

1. ACTIVITY/SHIP NAME/HULL NUMBER

SECTION II — DESCRIPTION

3. REPORT TYPE
(1) ☐ MAINTENANCE
(2) ☐ DEFICIENCY
(3) ☐ ORDALT/CHANGE
(4) ☐ LOGISTIC
(5) ☐ RUDTORPE
(6) ☐ OTHER (SPECIFY)

4. EQUIPMENT REPORTED ON
(1) ☐ WEAPON/VEHICLE
(2) ☐ TEST/SUPPORT EQUIPMENT
(3) ☐ DOCUMENTATION/ PROCEDURES
(4) ☐ SPARES
(5) ☐ OTHER (SPECIFY)

5. TYPE OF ACTION
(1) ☐ WARSHOT TURNAROUND/VERIFICATION
(2) ☐ PREPARATION/CONVERSION
(3) ☐ SPECIAL RETURN ACTIONS
Mk 46 ONLY
CLASS "A" ☐ "B" ☐
(4) ☐ EXERCISE (POST FIRING) TURNAROUND IF EXERCISE TURNAROUND ACTION, ENTER FIRING DATA BELOW
UIC | JULIAN

6. DEFICIENCY FOUND DURING
WEAPON/VEHICLE
(1) ☐ RECEIPT/DAMAGE INSPECTION
(2) ☐ DISASSEMBLY INSPECTION
(3) ☐ COMPONENT TURNAROUND
(4) ☐ COMPONENT/FIR TEST
(5) ☐ INITIAL ASSEMBLY
(6) ☐ SYSTEM TEST
(7) ☐ FINAL ASSEMBLY
(8) ☐ RUN ANALYSIS
(9) ☐ OTHER (SPECIFY)

TEST EQUIPMENT
(1) ☐ CALIBRATION
(2) ☐ WEAPON/VEHICLE TEST
(3) ☐ SELF TEST
(4) ☐ VISUAL INSPECTION
(5) ☐ FIR TEST
(6) ☐ OTHER (SPECIFY)

7. WEAPON/VEHICLE/EQUIPMENT I.D.	MK	MOD	REGISTER/SERIAL NO.	8. RUN NUMBER	S/R	9. TORPEDO NALC INCOMING	9. TORPEDO NALC OUTGOING	10. MOD	11. NEXT SCHEDULED MAINTENANCE CLASS "A" ☐ "B" ☐ DSLE ☐

12. TEST EQUIP. ☐ USED ☐ DEFICIENT	MK	MOD	SER. NO.	S/R	13. TEST DOC/PROCEDURE ☐ USED ☐ DEFICIENT	VOL	REV	CHANGE	PARA/STEP

SECTION III — MATERIAL IDENTIFICATION/ACTION

14. ASSY/FIR ITEM/PART	DRAWING NUMBER AND REVISION	REFERENCE DESIGNATOR	SERIAL NUMBER	REPLACEMENT SERIAL NUMBER	15. ORDALT/CHANGE NO.	16. R/I	17. S/R	18. P/D	19. S/CL/TABLE	TEST TAPE AND REV.	20. FILE CODES TEST STEP	BLOCK

21. NARRATIVE (1) DESCRIPTION (2) SHOP ACTION (3) RECOMMENDATIONS

22. REC'D FROM (UIC)

SHIP TO (UIC)

23. MANHOUR/MATERIAL EXPENDITURES		24. REFERENCES/ENCLOSURES	
MAN/HOURS	MATERIAL COST	25. NAME OF ORIGINATOR	SUBMITTED DATE (JULIAN)

Figure 3-32.—Torpedo Maintenance Data Form, NAVSEA Form 8510/5.

weapon. Effective reports are necessary to enable the distribution of essential maintenance, deficiency, and operational performance data to cognizant activities for further engineering analysis. Recognition and resolution of existing or potential torpedo deficiencies are thereby facilitated and torpedo readiness and capability improved. Feedback information resulting from analysis of the reports will be provided to maintenance activities and to contractor repair facilities, subsequently enhancing overall logistic support of the weapon system.

Reporting deficiencies and maintaining serialized accountability of major serialized components of the heavyweight torpedo weapon system is accomplished using a single reporting system: The Heavyweight Torpedo Technical Data System (HTTDS).

TORPEDO MANAGEMENT INFORMATION SYSTEM (TMIS)

The Torpedo Maintenance Data Form, NAVSEA Form 8510/5, (fig. 3-32) will be used by organizational level maintenance activities in accordance with TW510-AA-PRO-020 to report corrective maintenance performed on the Mk 48 and Mk 48 ADCAP torpedo hardware. This form will also be used as an informal communication vehicle (RUDTORPE) for reporting type deficiencies, comments, and recommendations.

The IMAs, RFI activities, and depots will use the following forms and manuals to report on the heavyweight torpedo Mk 48/Mk 48 ADCAP:

Torpedo	Form	Manual
Mk 48	8510/5 (fig. 3-32)	TW510-AA-PRO-030
Mk 48 ADCAP	8510/X (fig. 3-33)	TW510-AA-PRO-040

Reporting

The following situations will be reported:

1. Failures and deficiencies identified in the torpedo, torpedo spares, and test equipment.
2. ORDALT accomplishment and verification of torpedo components and test equipment.
3. Maintenance actions as prescribed in the TMIS manual.
4. Comments, reports, and recommendations of a RUDTORPE nature.
5. Additional information as specified in TW510-AA-PRO-030 and TW510-AA-PRO-040.

Organizational Maintenance Level

NAVSEA Form 8510/5 will be completed in accordance with NAVSEA Technical Document TW510-AA-PRO-020, and will be used by submarine personnel to report the following basic types of data:

- Corrective maintenance performed on Mk 48/Mk 48 ADCAP torpedo, associated tools, and handling equipment.
- Deficiency reports completed during incoming inspection (or "Receipt and Damage" inspection), handling operations, and/or preparations for firing. Additionally, deficiencies that are discovered that preclude the employment of a weapon and/or result in an unscheduled off-load.
- RUDTORPE Report is used when providing or requesting information relative to procedures, documentation, disposition, and support problems relating to weapon maintenance, handling, or use.

RUDTORPE-type reports are intended to be an informal communication vehicle between maintenance activities and cognizant government support agencies from which appropriate remedial action will be effected. These reports are required to promote an awareness and resolution of any deficiencies that may detract from fleet readiess. RUDTORPE reports will be submitted under the following occasions:

1. When receipting for deficient weapons from an IMA.

2. When recommending improvement to the design, performance, and reliability of the torpedo and its associated support equipment.

3. When recommending improvements to equipment and personnel safety, maintenance and handling procedures, test requirements, equipment/material preservation, and hardware packaging.

4. When highlighting supply support problems.

5. When recommending proposed changes and improvement of weapon system publications.

6. When requesting authority to accomplish a survey of unsatisfactory, defective, or obsolete torpedoes and weapon system components;

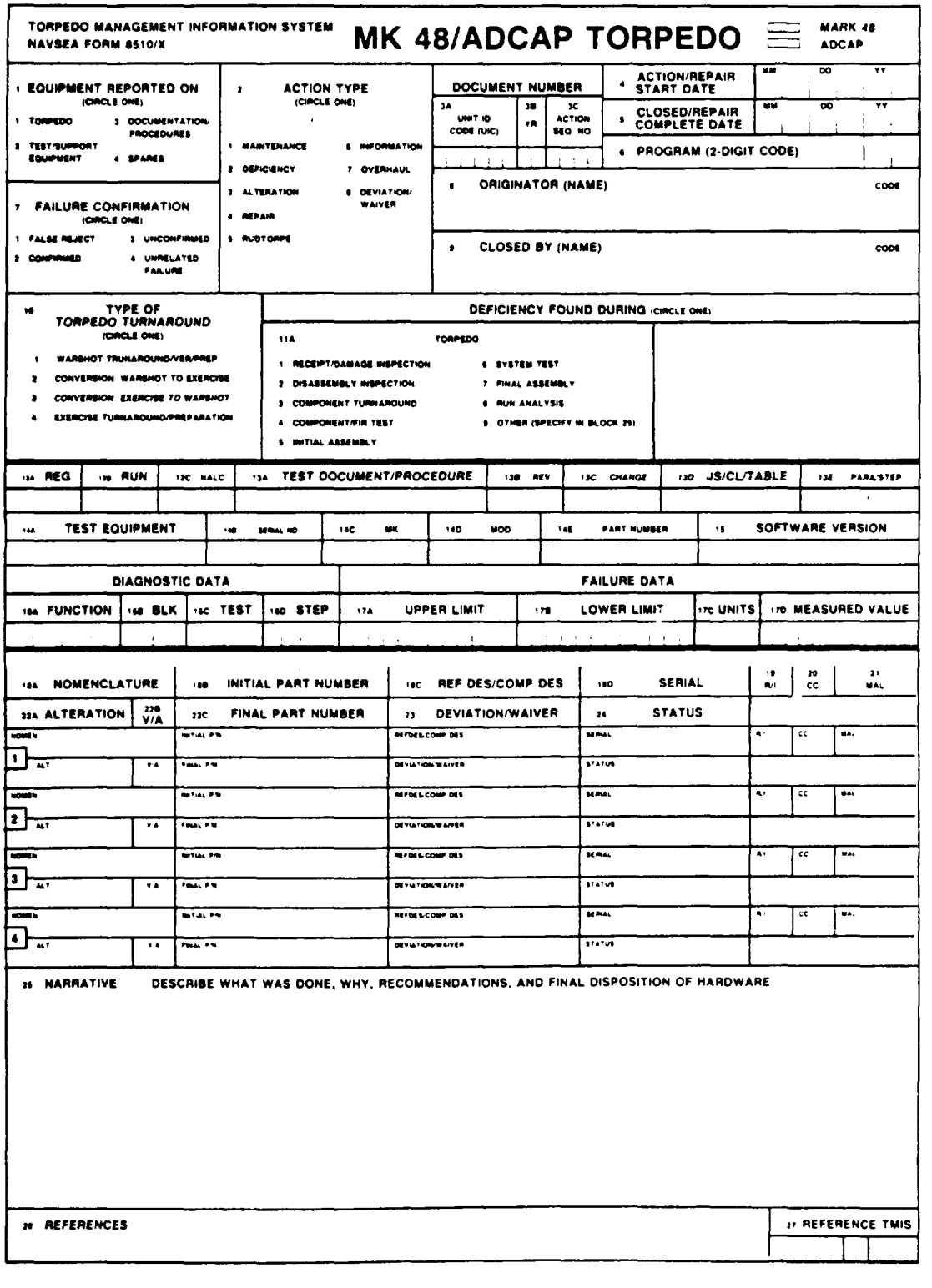
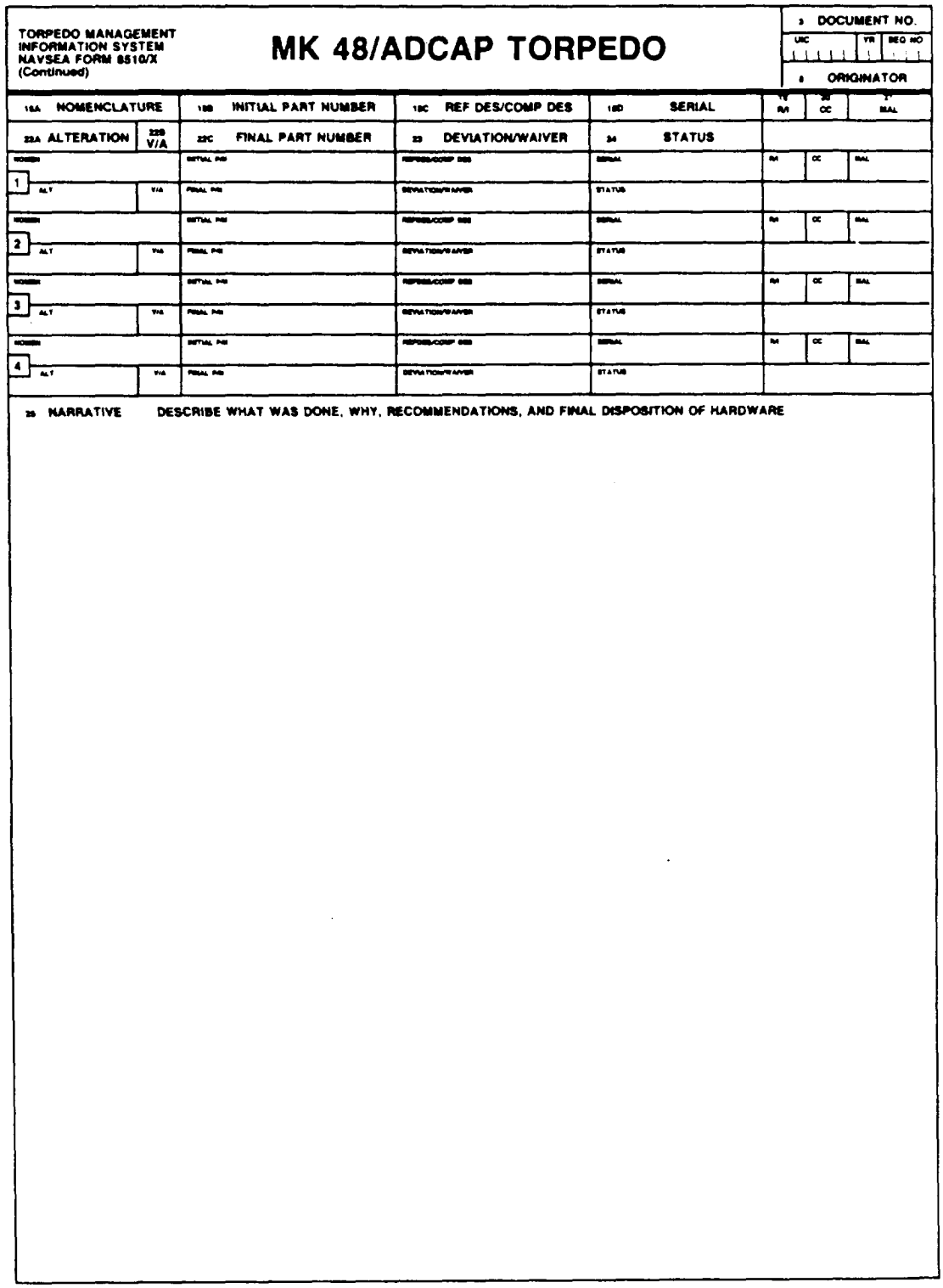


Figure 3-33.-Torpedo Management Information System, NAVSEA Form 8510/X.



TORPEDO MANAGEMENT INFORMATION SYSTEM
NAVSEA FORM 8510/X
(Continued)

MK 48/ADCAP TORPEDO

3 DOCUMENT NO.
UIC | YR | SEQ NO

8 ORIGINATOR

18A NOMENCLATURE		18B INITIAL PART NUMBER	18C REF DES/COMP DES	18D SERIAL	19 RMI	20 CC	21 MAL
22A ALTERATION	22B V/A	22C FINAL PART NUMBER	23 DEVIATION/WAIVER	24 STATUS			
WORDEN		INITIAL P/N	REF DES/COMP DES	SERIAL	RMI	CC	MAL
1 ALT	V/A	FINAL P/N	DEVIATION/WAIVER	STATUS			
WORDEN		INITIAL P/N	REF DES/COMP DES	SERIAL	RMI	CC	MAL
2 ALT	V/A	FINAL P/N	DEVIATION/WAIVER	STATUS			
WORDEN		INITIAL P/N	REF DES/COMP DES	SERIAL	RMI	CC	MAL
3 ALT	V/A	FINAL P/N	DEVIATION/WAIVER	STATUS			
WORDEN		INITIAL P/N	REF DES/COMP DES	SERIAL	RMI	CC	MAL
4 ALT	V/A	FINAL P/N	DEVIATION/WAIVER	STATUS			

25 NARRATIVE DESCRIBE WHAT WAS DONE, WHY, RECOMMENDATIONS, AND FINAL DISPOSITION OF HARDWARE

Figure 3-33.-Torpedo Management Information System, NAVSEA Form 8510/X—Continued.

additionally, when requesting disposition instruction for these items.

- Corrective maintenance reports for the torpedo will be submitted for those actions occurring before application of warmup power with an intent to fire. After warmup power is applied (with intent to fire), COMSUBLANT and COMSUBPAC activities will report information required by message.

Classified data will not be submitted on the TMIS form. Classification of other submitted forms will be in accordance with Appendix A of NAVSEA OD 45814 and NAVORDINST 5511.35.

Organizational level activities will also provide copies of each report to other fleet commands in accordance with type commander's instructions. The organizational level reports pertaining to Mk 48 torpedo are also assigned a TMIS number and are included in the TMIS closed-loop feedback reporting system.

Intermediate Maintenance Level

IMA personnel will complete and submit a Torpedo Management Information System (TMIS) Report, in accordance with NAVSEA technical document TW510-AA-PRO-030 for the Mk 48 Torpedo, or technical document TW510-AA-PRO-040 for the Mk 48 ADCAP torpedo, intermediate level maintenance activity reporting instructions, for submarine fired weapons/ vehicles. These instructions provide detail directions and procedures relating to entry of appropriate data in each block of the forms along with representative examples of the various types of reports required to be submitted.

NAVSEA Forms 8510/5 and 8510/X are tailored to Mk 48 torpedo requirements and should be completed as soon as possible after occurrence of the event to be reported, so that timeliness of the data will be maintained.

Whenever additional or corroborative data is obtained or discovered after submittal of a TMIS report, maintenance personnel will add/ update data to the original TMIS and submit a copy of the updated TMIS to the HTTDS site representative. If the situation merits, a supplementary TMIS may be written that references the original.

SUMMARY

When performing maintenance on a heavyweight torpedo, safety must be an essential part of the planning. The heavyweight torpedo has three levels of maintenance: organizational, intermediate, and depot. At the organizational level, the submarine is responsible for minimal torpedo maintenance and RFI accountability. The intermediate level is where most of the maintenance will be performed. This will include extensive torpedo overhaul, workshop equipment repair, calibration support, container maintenance as well as maintenance of special tools. Depot level maintenance plays a large role in the maintenance of the warshot heavyweight torpedo. It is normally completed by civilian contractor and includes the repair of a major number of the test sets. We have addressed the differences in maintenance requirements as they relate to the Mk 48 and the Mk 48 ADCAP.

The records and reports required for the heavyweight torpedo do vary for the Mk 48 and the Mk 48 ADCAP, but as we have just learned, the differences were minimal.

REFERENCES

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